

Soil Survey

Scioto County Ohio

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BUREAU OF PLANT INDUSTRY

In cooperation with the
Ohio Agricultural Experiment Station

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SOIL SURVEY OF SCIOTO COUNTY, OHIO

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United States Department of Agriculture in cooperation with the Ohio Agricultural Experiment Station

COUNTY SURVEYED

Scioto County is in the south-central part of Ohio on the Ohio River (fig. 1). Portsmouth, the county seat, is about 85 miles south of Columbus and 85 miles southeast of Cincinnati. The county is of irregular shape, the greatest east-west dimension being about 33 miles and the greatest north-south dimension about 28 miles. The total area is 623 square miles, or 398,720 acres.

The county lies wholly within the western part of the Kanawha section of the Appalachian Plateaus,² which extends westward about 6 miles into Adams County, where an abrupt escarpment, about 300 feet high, marks the border of the plateau and separates it from the interior lowland on the west. The surface is deeply and maturely dissected by an intricate network of valleys.

Two wide valleys cross the county from north to south. California Valley in the eastern part, ranging in width from 1 to 2 miles, extends

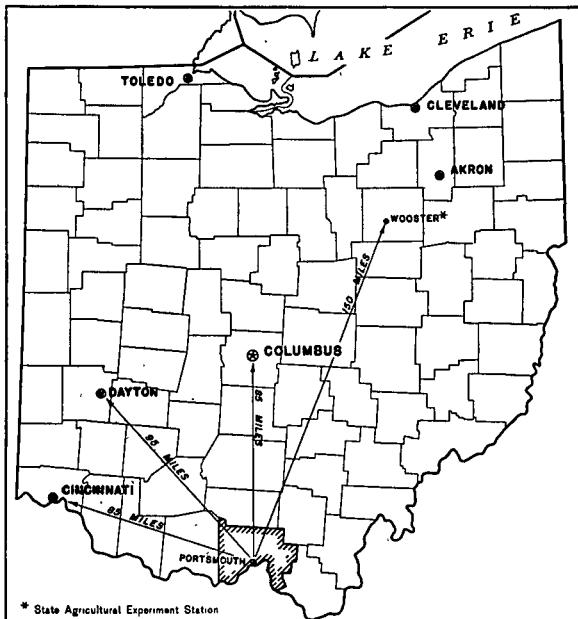


FIGURE 1.—Sketch map showing location of Scioto County, Ohio.

¹ The Soil Survey Division was transferred to the Bureau of Plant Industry July 1, 1939.
² FENNEMAN, N. H. PHYSIOGRAPHIC DIVISIONS OF THE UNITED STATES. Ann. Assoc. Amer. Geogr. 6: [19]-98, illus. 1917.

from Stockdale just north of the county line, past Purdy Corners to Wheelersburg, where the Ohio River Valley crosses it. No large stream occupies this valley, but Little Scioto River crosses it in several places. The valley floor is more than 100 feet above the Ohio River Valley. Evidently the drainage of California Valley, in preglacial times, was northward, but due to glaciation its outlet was obstructed and a ponded condition was developed, during which the valley was filled by silt and clay and subsequently was abandoned by streams as Ohio River was developed. Remnants of this valley can be traced up Ohio River as far as Ironton where it joined the old Teays Valley of West Virginia.

Scioto River Valley, which ranges from $1\frac{1}{2}$ to 2 miles in width, crosses the county from north to south, but the elevation of its floor is so low that at present it is largely subject to inundation. Remnants of a former valley at a higher elevation occur on level areas just north of Portsmouth, east of Lucasville, near the county line northeast of Clifford, on the western side of Scioto Valley, and along Ohio River southwest of Portsmouth. Ohio River occupies a comparatively narrow valley, except above Wheelersburg, where it coincides with a continuation of the old California Valley.

The western part of the county, including the area west of Scioto Valley, and between this and California Valley, is very rugged and broken, as it is greatly dissected by many small but deep stream valleys reaching to all parts of the section. The ridge tops are narrow, the slopes steep, and the valley bottoms narrow, except along a few of the main streams. Nile Township, in the southwestern part of the county, is especially rugged, but in the southern part the ridge tops are sufficiently wide for some agricultural use.

The land east of California Valley is rolling, but throughout much of this part of the county the slopes are not so steep as those to the west. The Coal Measures formations have yielded more readily to erosion, so that the valleys have been widened and the slopes have become less marked. A larger proportion of this section has a relief favorable for agriculture than have the western townships.

Much of the California Valley is nearly level, except where it is crossed by Little Scioto River and its tributaries, especially from Wheeler southward to Ohio River, where it has been considerably dissected and terraced. Owing to a high water table for long periods a large part of this valley has very poor natural drainage.

The elevation of the county, as given on the United States Geological Survey topographic sheets, ranges from 464 feet above sea level at low-water mark along Ohio River at the Adams County line to slightly more than 1,300 feet southeast of Mount Joy, giving a range in relief of more than 800 feet. The elevation of the terraces along Ohio River in this part of the county is rather uniform, about 540 feet, and the nearby upland has an elevation ranging from 1,000 to 1,100 feet. In the southeastern part of the county, south of Wheelersburg, the terrace along Ohio River ranges in altitude from 536 to 548 feet. North of Portsmouth most of the ridge tops have an elevation of about 1,050 feet, although a few ridges reach a height of 1,100 feet. East of California Valley the highest ridges are slightly more than 900 feet in elevation. The floor of California Valley ranges from 650 to 700 feet. Here, the local range in relief is about 200 feet. The Scioto River bottoms range from 500 to 550

feet above sea level, that is, they are about 500 feet below the adjacent upland.

Scioto County originally was heavily forested. The virgin forest consisted predominantly of mixed hardwoods (a mixed mesophytic forest) in all parts of the county, except along the ridges in the southwestern part where pine seems to have been dominant. Practically no virgin forest remains today, and in places second and third cuttings have been made, although at present about 38 percent of the total area consists of wooded land. In Nile Township about 77 percent of the land is wooded. The virgin forest included a variety of trees, the most important being white oak, chestnut oak, chestnut, tuliptree, and shortleaf pine. The present mixed hardwood stand differs somewhat from the original. On the ridge tops it includes chestnut oak, black oak, post oak, scarlet oak, blackjack oak, white oak, chestnut, hickory, and black gum; and on the slopes black oak, scarlet oak, white oak, chestnut, red maple, black gum, post oak, hickory, and basswood grow. In coves with northern and western exposures and on benches or high terraces the forest includes chiefly white oak, chestnut oak, tuliptree, black oak, basswood, and beech. In the south-central and southwestern parts of the county a mixed hardwood and pine forest includes pitch pine and shortleaf pine on the upper slopes and ridges and scrub pine on the lower slopes. A few small areas support an almost clear stand of pine, chiefly in old fields and in openings in the hardwood forest. In Nile Township and adjoining townships is the largest unbroken forest area in Ohio. A considerable part of it is included in the Shawnee State Forest and the Roosevelt Game Preserve.

Scioto County was formed in 1803. The junction of the Scioto and Ohio Rivers occupied an important place in the early explorations in this section. The early settlers came by way of Ohio River from Pennsylvania, New York, Virginia, and the New England States. The township of Green, known as the French Grant, was settled by a number of French families. Opposite Portsmouth, on the western side of Scioto River, the village of Alexandria was founded at an early date and for a time was the seat of local government. The first permanent settlement at Portsmouth was in 1796; the town was laid out in 1803, and it was incorporated in 1814. Because of its high elevation above Ohio River, Portsmouth has grown to a city of importance, whereas Alexandria, which was located on low ground subject to overflow during floods, soon ceased to exist.

Areas in the valleys and along the main highways are the most thickly populated. On the smoother uplands in the eastern part of the county, and the broader ridge tops elsewhere, the population is fairly uniform, but in the rugged southwestern townships it is very sparse. Many of the valleys within 10 or 15 miles of Portsmouth are inhabited by people who find employment in the factories near that city.

The population, according to the 1930 census, was 81,221 in that year, of which 48,491 were urban and 32,730 were rural. Of the rural population, 13,427 were classed as rural-farm and 19,303 as rural-nonfarm. The population is made up very largely of native whites whose ancestors came from Germany, Ireland, England, and France.

During the last 10 years considerable numbers of families have come into the county from Kentucky, attracted by the opportunity for employment in the local factories and mills.

Portsmouth, the county seat, had a population of 42,560 in 1930. It is an important manufacturing center. New Boston, with a population of 5,931, is another manufacturing town. Lucasville is the center of an agricultural community. Buena Vista, in the extreme southwest part, was formerly the site of extensive sandstone quarries. South Webster, in the eastern part, has an important clay-products industry and is a shipping center. Other shipping points are Sciotosville, Wheelersburg, Rarden, Youngs, Otway, and McDermott.

Transportation facilities are furnished by the Norfolk & Western Railway, Baltimore & Ohio Railroad, Chesapeake & Ohio Railway, and Detroit, Toledo & Ironton Railroad. The Norfolk & Western Railway, the main line of which extends to Cincinnati, with a branch to Columbus, is an important coal-shipping road which maintains extensive freight yards at Portsmouth. A branch of the Chesapeake & Ohio Railway crosses the Ohio River at Sciotosville and terminates at Columbus. It hauls large quantities of coal, especially for lake shipment at Toledo. A branch of the Baltimore & Ohio Railroad connects with the main line at Hamden. The Detroit, Toledo & Ironton Railroad crosses Bloom and Vernon Townships. The chief means of transportation in the early days was by boat on the Ohio River. The construction of a series of dams and locks, however, has made navigation possible throughout the year, so that a considerable volume of freight still is transported on the river.

The county is well supplied with improved roads. United States Highway No. 52 (Atlantic and Pacific Highway) follows the Ohio River, and United States Highway No. 23 (the Scioto Trail), from Sandusky and Columbus, terminates at Portsmouth. Besides these main highways, intercounty and some other roads have been hard-surfaced or graveled, so that the main roads to nearly all sections are passable throughout the year. A vehicular bridge across Ohio River at Portsmouth has been completed recently. Most of the county is well supplied with telephone lines and schools.

The local industries include the production of fire and paving brick, steel, soda ash, building stone, flagging, and shoes. These industries employ large numbers of people, many of whom live on farms at distances ranging from 15 to 25 miles and drive daily to work.

CLIMATE

The climate is favorable for agriculture. It is continental in type, with considerable variation from summer to winter. The rainfall averaging 41.98 inches, is fairly evenly distributed throughout the year. Usually it is somewhat higher in early spring and early summer than throughout the rest of the year. The rainfall in the late summer and fall months tends to be somewhat lower. The average annual snowfall is 19.1 inches. Snow seldom stays on the ground for any considerable length of time. The average length of the frost-free season at Portsmouth is 184 days, from the average date of the latest killing frost, April 18, to the average date of the earliest, October 19. Frost has occurred as late as May 17 and as early as September 30. Because of the wide differences in elevation and slope in various parts

of the county, considerable difference occurs in the length of the frost-free period, but no data are available to show the exact amount of these differences. It is recognized generally that many of the slopes with fair depth of soil make ideal orchard sites, because of the protection from frost as a result of air drainage. During the critical seasons the temperature probably ranges from 10° to 15° lower at night in the valleys than on the ridges, although in the larger valleys, such as the Ohio River Valley, the presence of the large stream and the frequent occurrence of fog during the fall tend to modify this effect.

Table 1 gives the normal monthly, seasonal, and annual temperature and precipitation as recorded at the United States Weather Bureau station at Portsmouth.

TABLE 1.—*Normal monthly, seasonal, and annual temperature and precipitation at Portsmouth, Scioto County, Ohio*

[Elevation, 527 feet]

Month	Temperature			Precipitation			
	Mean	Absolute maximum	Absolute minimum	Mean	Total amount for the driest year (1930)	Total amount for the wettest year (1890)	Snow, average depth
December.....	° F. 36.7	° F. 72	° F. -15	Inches 3.43	Inches 1.76	Inches 3.60	Inches 3.3
January.....	34.8	75	-17	4.16	2.65	5.62	6.1
February.....	36.8	80	-18	3.04	2.93	7.02	5.1
Winter.....	36.1	80	-18	10.63	7.34	16.24	14.5
March.....	45.0	96	2	4.22	2.89	8.42	3.3
April.....	55.5	97	20	3.46	1.35	3.54	.6
May.....	64.9	99	30	3.47	1.42	4.33	(1)
Spring.....	55.1	99	2	11.15	5.66	16.29	3.9
June.....	72.7	102	41	4.01	1.18	4.23	.0
July.....	76.7	106	42	4.39	.72	2.98	.0
August.....	74.4	105	46	3.79	3.20	6.36	.0
Summer.....	74.6	106	41	12.19	5.10	13.57	.0
September.....	68.2	101	32	2.47	2.04	4.40	.0
October.....	56.1	94	18	2.71	1.13	3.87	(1)
November.....	45.1	84	6	2.83	1.37	3.22	.7
Fall.....	56.5	101	6	8.01	4.54	11.40	.7
Year.....	55.8	106	-18	41.98	22.64	57.59	19.1

¹ Trace.

AGRICULTURE

The development of agriculture began with the early settlement along the river terraces and bottoms, and later the more gently rolling parts of the upland were cleared. By 1880, according to the Federal census, about 69 percent of the land was in farms. During recent years some of the hill land formerly used for farming has been abandoned. In 1935, 64.3 percent was reported in farms with an average size of 77.7 acres each. Of the land in farms in that year 42.4 percent was reported as available for crops. This included cropland harvested, idle or fallow land, land on which crops were a failure, and plowable

pasture. Woodland occupies 38.3 percent and all other land in farms 19.3 percent.

For many years general farming has been the chief agricultural pursuit, and there is little tendency toward specialization. Some tobacco is grown, and locally, trucking, fruit growing, and dairying are important.

Corn has always been the most important crop, its acreage being much greater than that in any other county in southeastern Ohio. This is owing to the large area of excellent land for corn in the Scioto River bottoms, where corn has been produced continuously for many years. The 1935 census reports 29,298 acres in corn in 1934, of which the corn from 28,638 acres was harvested for grain yielding 1,027,349 bushels. The acreage has been fairly constant for many years. The average acre yield of corn was larger during the fifties than during any later decade. Most of the crop is harvested for grain.

Wheat is the second most important grain crop. A total of 6,246 acres produced 103,533 bushels in 1934. Between 1860 and 1880 the yields of wheat declined very markedly, but during the last 30 or 40 years, as a result of the use of commercial fertilizers, yields have increased somewhat, although the average yield is still too low for much profit.

The acreage of oats has decreased very greatly during recent years, largely as a result of the low yields obtained. The 1935 census reported 411 acres yielding 6,469 bushels in 1934, and 864 acres from which oats were cut and fed unthreshed. In 1880 the total area was 9,852 acres. In common with other parts of southern Ohio, the low yields probably are a result of the climatic conditions, which are unfavorable for the production of spring oats.

Buckwheat is grown with fair returns on some of the level poorly drained land. In 1929 the area devoted to this crop was 351 acres and the yield was 6,070 bushels. The buckwheat acreage was not reported by the 1935 census.

Hay and forage crops occupied a total of 14,856 acres in 1934, with a production of 15,570 tons. Timothy alone and timothy and clover mixed occupy about equal acreages. On the Ohio River terraces and the Scioto River bottoms, mixed hay and alfalfa are commonly grown, whereas on the upland most of the hay is timothy, except where the land has been limed. Alfalfa was grown on 1,289 acres in 1934, yielding 2,785 tons.

Tobacco, chiefly burley, has been grown in a small way for many years in the western part of the county on the Ohio River terraces and in some of the valleys. In 1934, 308 acres yielded 245,993 pounds. A small acreage is devoted to potatoes by most farmers. The total acreage in 1934 was 1,552 acres, with a production of 88,110 bushels. Truck crops, chiefly sweet corn, string beans, tomatoes, cabbage, and watermelons, were harvested for sale from 1,084 acres in 1934.

Fruit growing on a commercial scale is rather limited, although there are a number of very good orchards. In 1935 the number of bearing apple trees was 95,746, peach trees 41,608, cherry trees 6,427, pear trees 2,778, and plum trees 2,531. Some of the ridge tops and slopes furnish ideal sites for orchards. Small fruits are grown to some extent. The Federal census reported 110 acres in strawberries in 1934. Some raspberries and blackberries also are grown. An interesting

scheme of small-fruit production has been developed a few miles east of Lucasville where raspberries and blackberries are grown on the very steep hillsides, and the fruit is brought down to the valley by means of a cable.

An expenditure of \$80,597 for fertilizer was reported in 1929, by 1,172 farms, or about 56 percent of all farms in the county. Superphosphate is the fertilizer most commonly used, and the 20-percent grade has become very popular during recent years. Mixed fertilizers are commonly used on wheat and tobacco. The preferred mixtures are 2-12-2, 2-16-2, and 3-8-6.³ Some carrier of nitrogen, such as sodium nitrate or ammonium sulfate, is used in the commercial orchards. Practically no fertilizer is used on cornland on the extensive bottoms.

The farm work is performed chiefly by the farmer and his family. The demand for labor in the factories and shops at Portsmouth makes the supply of hired labor on the farms very limited, although some is available during slack times in the factories. Most of the hired laborers are natives, and some of the small-farm operators work, at times, for their neighbors. In 1929 the expenditure for labor on 783 farms, or about 38 percent of the number of farms in the county, was \$192,837.

According to the 1935 census, the average size of farms in Scioto County is 77.7 acres. The size has gradually decreased during the last 40 years. Most of the farms range in size from 50 to 99 acres, and only 5 farms include 1,000 or more acres. During the last few years the number of small farms including less than 10 acres each has increased considerably. These farms are owned by people employed in the factories and shops in Portsmouth.

Of the 3,300 farms in this county in 1935, the census reported 2,389 operated by full owners, 251 by part owners, 654 by tenants, and 6 by managers. Tenancy has decreased to some extent in recent years. Cash rent is paid by about 30 percent of the tenants, and the others give a part of the crop as rent.

In the larger valleys and the less rolling uplands the farms are equipped with good buildings and modern machinery, including tractors. Farms in the rougher and more hilly parts commonly have only fair buildings and light machinery, and comparatively little of the grain is threshed. The type of work animals and of livestock in general corresponds fairly well with the class of buildings and other equipment.

Dairying and livestock raising are the most important agricultural enterprises. A number of excellent purebred dairy herds are on the farms in the vicinity of Portsmouth, but by far the greater proportion of the dairy cattle are grade animals. Jersey, Holstein-Friesian, and Guernsey are the principal breeds. Most of the herds are small, including from 5 to 10 cows, although there are a few herds of 30 to 40 cows. A large proportion of the milk is sold as whole milk for consumption in Portsmouth and nearby villages. Improved roads have made it possible to haul milk by truck from nearly all parts of the county. Several good herds of beef cattle are in the county, and a number of feeders in Scioto River Valley ship cattle from the West and feed them during the winter for the

³ Percentages, respectively, of nitrogen, phosphoric acid, and potash.

spring market. Hog raising is a minor branch of livestock farming, as also is the raising of sheep.

The 1930 census gives the number of cattle in Scioto County on April 1 of that year as 14,134, swine 6,592, sheep 1,043, horses 2,925, and chickens 106,916. The 1935 census reports on January 1, 2,876 horses; 1,267 mules; 15,376 cattle, of which 7,636 were milk cows producing 3,181,757 gallons of milk in 1934; 1,055 sheep; 7,412 swine; and 146,154 chickens. In 1934, 189,232 chickens were raised on the farms, and 682,023 dozens of eggs were produced.

Poultry raising is important on most farms, and a few farms specialize in poultry raising and egg production, but by far the largest numbers of poultry are raised in conjunction with general farming. Most farmers have a mixture of Plymouth Rocks, White Leghorns, and Rhode Island Reds, but the White Leghorn is the favorite breed.

Lumbering is still of some importance in the western part of the county, where a number of portable sawmills are in operation. Many cross ties, poles, and posts are trucked out each year. According to the 1930 census, 2,279,000 board feet of sawlogs were cut on 123 farms in 1929, 11,669 cords of firewood on 588 farms, 919 cords of pulpwood on 43 farms, 21,824 fence posts on 121 farms, 27,417 railroad ties on 99 farms, and 6,127 poles and piling on 17 farms.

SOIL-SURVEY METHODS AND DEFINITIONS

Soil surveying consists of the examination, classification, and mapping of soils in the field.

The soils are examined systematically in many locations. Test pits are dug, borings are made, and exposures, such as those in road or railroad cuts, are studied. Each excavation exposes a series of distinct soil layers, or horizons, called, collectively, the soil profile. Each horizon of the soil, as well as the parent material beneath the soil, is studied in detail; and the color, structure, porosity, consistence, texture, and content of organic matter, roots, gravel, and stone are noted. The reaction of the soil⁴ and its content of lime and salts are determined by simple tests. Drainage, both internal and external, and other external features, such as relief, or lay of the land, are taken into consideration, and the interrelation of soils and vegetation is studied.

The soils are classified according to their characteristics, both internal and external, special emphasis being given to those features influencing the adaptation of the land for the growing of crop plants, grasses, and trees. On the basis of these characteristics soils are grouped into mapping units. The three principal ones are (1) series, (2) type, and (3) phase.

The most important group is the series, which includes soils having the same genetic horizons, similar in their important characteristics and arrangement in the soil profile, and developed from a particular type of parent material. Thus, the series includes soils having essentially the same color, structure, and other important inter-

⁴The reaction of the soil is its degree of acidity or alkalinity expressed mathematically as the pH value. A pH value of 7 indicates precise neutrality, higher values indicate alkalinity, and lower values indicate acidity.

nal characteristics and the same natural drainage conditions and range in relief. The texture of the upper part of the soil, including that commonly plowed, may vary within a series. The soil series are given names of places or geographic features near which they were first found. Thus, Muskingum, Pope, and Holston are names of important soil series in this county.

Within a soil series are one or more soil types, defined according to the texture of the upper part of the soil. Thus, the class name of the soil texture, such as sand, loamy sand, sandy loam, loam, silt loam, clay loam, silty clay loam, and clay, is added to the series name to give the complete name of the soil type. For example, Muskingum loam and Muskingum silt loam are soil types within the Muskingum series. Except for the texture of the surface soil, these soil types have approximately the same internal and external characteristics. The soil type is the principal unit of mapping, and because of its specific character it is usually the soil unit to which agronomic data are definitely related.

A phase of a soil type is a variation within the type, which differs from the type in some minor soil characteristic that may have practical significance. Differences in relief, stoniness, and the degree of accelerated erosion frequently are shown as phases. For example, within the normal range of relief for a soil type, there may be areas that are adapted to the use of machinery and the growth of cultivated crops and others that are not. Even though there may be no important difference in the soil itself or in its capability for the growth of native vegetation throughout the range in relief, there may be important differences in respect to the growth of cultivated crops. In such instances the more sloping parts of the soil type may be segregated on the map as a sloping or hilly phase. Similarly, soils having differences in stoniness may be mapped as phases, even though these differences are not reflected in the character of the soil or in the growth of native plants.

The soil surveyor makes a map of the county or area, showing the location of each of the soil types, phases, complexes, and miscellaneous land types, in relation to roads, houses, streams, lakes, section and township lines, and other local cultural and natural features of the landscape.

SOILS AND CROPS

The soils of Scioto County can be grouped on the basis of relief in four outstanding classification units: (1) Soils of the Muskingum group, including the principal upland soils of residual origin, and making up a very large part of the county; (2) soils of the Holston group, including soils of the terraces in old valleys; (3) soils of the Wheeling group, including soils of the Ohio River terraces; and (4) soils of the alluvial bottom lands.

Soils of the Muskingum group are the dominant soils of the uplands. They all are light in color, and the texture ranges from loam to silty clay loam, the silt loam predominating. They are residual from sandstone and shale, the sandstone influence predominating in the western half of the county. These soils occupy the rolling uplands

in all parts where the chief feature determining agricultural value of the land is degree of slope or relief. The ridge tops and gentler slopes can be utilized for intertilled crops, but the steeper slopes are better adapted to permanent pasture or forestry. Serious erosion is in evidence on the cleared hillsides. The agricultural value of these soils is further influenced by the degree of stoniness. Some areas with favorable relief are too stony for the production of crops and can be used only for pasture. All these soils are acid in reaction.

Soils of the Holston group include the soils on the level to gently undulating terraces in old valleys and along the sides of some of the younger valleys. These soils are predominantly light in color and silt loam in texture. Their greatest development is in California Valley in the eastern part of the county. Owing to the nearly level surface and the more or less impervious subsoil, some areas have fair to poor natural drainage. The Holston soils have good drainage, the Monongahela soils have imperfect drainage, the Tyler soils have poor drainage, and the Purdy soils have very poor drainage. The relief is favorable for the production of crops, and, where adequately drained, the crops adapted to the section can be grown successfully. A very acid condition is characteristic of these soils, especially the poorly drained members of the group.

The soils of terraces along the Scioto and Ohio Rivers are included in the soils of the Wheeling group. The terraces seldom are flooded except at extreme flood stages. The Wheeling soils are naturally well drained, whereas the Scioto and Ginat soils have fair to very poor drainage. The Mill Creek soils are well drained, and the Homer soils are imperfectly drained. The better drained soils are only slightly acid, but those with poor drainage are moderately to strongly acid in reaction. Because of the favorable relief, these soils are used for the production of a variety of crops, among which corn is the most important. Wheat, alfalfa, soybeans, and tobacco are commonly grown.

A belt of alluvial soils about 2 miles wide occupies the Scioto River Valley, which crosses the central part of the county in a north-south direction. They are light in color and range in texture from silt loam to silty clay loam, although a few sandy areas are included. The drainage from a large area of soil developed on calcareous glacial deposits to the north is carried by Scioto River, and hence these soils have been included in the Genesee, Eel, and Wayland series. The Genesee soils have fair to good drainage, whereas the natural drainage of the Eel and Wayland soils is poor. The reaction of these soils generally is approximately neutral. They are subject to one or more inundations each year during times of flood, thus limiting the variety of crops which can be grown. Adjacent to Ohio River the soil materials are heavier than to the north, their deposition evidently resulting, at least in part, from backwater from Ohio River. These soils have been included in the Huntington, Linside, and Melvin series. The Huntington soils are well drained, the Linside fairly well drained, and the Melvin poorly drained. The reaction of all these bottom-land soils ranges from slightly alkaline to slightly or moderately acid in reaction. The bottom lands of small valleys and creeks that drain the shale and sandstone uplands are characterized by moderately to

strongly acid alluvium which gives rise to the Pope, Philo, and Atkins soils. The Pope soils are well drained, the Philo fairly well drained, and the Atkins poorly drained. All are acid in reaction. Corn is an important crop on these areas.

Associated with the flood plain soils in Scioto River Valley are rather small areas of level but low terraces bordering the valley sides which are underlain by gravel at a moderate depth. These are known as high-bottom phases of Genesee and Huntington soils and are seldom covered by floodwaters, hence are adapted to a greater variety of crops than are the typical Genesee and Huntington soils.

Among the crops grown in this county corn ranks first. Its extensive production is confined to the Scioto River bottoms and to the Ohio River bottoms and terraces, although it is grown to some extent in all sections. In the more rolling areas the acreage is small and the yields are low, and throughout the upland area small patches of corn are grown on the narrow tracts of bottom land.

Wheat and oats are the most important small-grain crops, but in general yields are low. Wheat is grown to some extent in all parts, but the best yields are obtained on the soils of the terraces. Rye is sometimes sown by farmers on the hill land, to provide a winter cover crop. Buckwheat is grown chiefly in California Valley, on the Monongahela, Purdy, and Tyler soils, where it returns fair yields.

Tobacco is grown in the western part, on the soils of the Ohio River terraces and on the higher bottoms along Scioto Brush Creek. This area of production is an eastward extension of the burley tobacco area of Adams County where the crop is grown chiefly on limestone soils, but the yields and quality are not so good as those of the tobacco produced on limestone land.

As a result of the acid condition of the soils, alfalfa is grown only to a very limited extent in the upland section, its most extensive production being on the neutral soils of the Scioto River bottoms and on the moderately acid soils of the Ohio River terraces, but with adequate liming and fertilizing alfalfa is grown successfully on the uplands. The usual grass seeding consists of timothy and clover mixed, although without liming the hay crop on the uplands commonly contains little clover. Soybeans for hay are grown on the Ohio River terraces and, to some extent, in California Valley and on the more level areas of the uplands.

In the rolling uplands many areas, which were cleared and utilized for crop production for a time, are now being used as permanent pasture. The vegetation in many places consists largely of poverty oatgrass, along with broomsedge, cinquefoil, and other weeds, which afford poor-quality pasture.

The large areas still in forest are mostly the steep phases of the Muskingum soils, the most extensive areas of which are in the south-central and western parts of the county. With adequate protection from fire, profitable forestry in this section is assured.

In the following pages, the soils of this county are described in detail, and their agricultural relationships are discussed; their location and distribution are shown on the accompanying soil map; and their acreage and proportionate extent are given in table 2.

TABLE 2.—*Acreage and proportionate extent of the soils mapped in Scioto County, Ohio*

Soil type	Acres	Per-cent	Soil type	Acres	Per-cent
Muskingum silt loam.....	47,424	11.7	Genesee silt loam, high-bottom phase.....	2,176	0.6
Muskingum silt loam, steep phase.....	103,744	26.0	Genesee fine sandy loam.....	512	.1
Muskingum silt loam, very steep phase.....	140,096	35.1	Genesee loam.....	960	.2
Muskingum silt loam, colluvial phase.....	2,752	.7	Genesee silty clay loam.....	576	.1
Muskingum stony silt loam.....	4,352	1.1	Eel silt loam.....	320	.1
Muskingum silty clay loam, steep phase.....	960	.2	Wayland silt loam.....	448	.1
Colyer shaly clay loam, steep phase.....	320	.1	Huntington loam.....	768	.2
Muskingum loam.....	1,024	.3	Huntington loam, high-bottom phase.....	64	(1)
Rarden silt loam.....	9,600	2.4	Huntington silty clay loam.....	1,344	.4
Rough broken land.....	768	.2	Huntington silty clay loam, high-bottom phase.....	128	(1)
Holston silt loam.....	11,840	3.0	Lindsdale silty clay loam.....	192	.05
Holston silt loam, slope phase.....	2,112	.5	Melvin silty clay loam.....	256	.1
Holston loam.....	256	.1	Riverwash.....	192	.05
Monongahela silt loam.....	9,792	2.5	Pope silt loam.....	17,536	4.4
Tyler silt loam.....	1,792	.5	Pope silt loam, high-bottom phase.....	512	.1
Purdy silt loam.....	1,536	.4	Pope gravelly silt loam.....	448	.1
Wheeling silt loam.....	4,864	1.2	Pope loam.....	1,536	.4
Wheeling loam.....	128	(1)	Philo silt loam.....	6,976	1.8
Sciotosville silt loam.....	5,056	1.3	Philo silt loam, high-bottom phase.....	128	(1)
Ginat silt loam.....	3,904	1.0	Philo loam.....	1,024	.3
Ginat silty clay loam.....	704	.2	Atkins silt loam.....	1,344	.4
Fox silt loam.....	320	.1	Atkins silty clay loam.....	192	.05
Fox loam.....	128	(1)	Mines, pits, and dumps.....	192	.05
Mill Creek silt loam.....	1,344	.4	Total.....	398,720	
Homer silt loam.....	640	.2			
Genesee silt loam.....	5,440	1.4			

¹ Less than 0.05 percent.

SOILS OF THE MUSKINGUM GROUP

Muskingum silt loam.—Muskingum silt loam is agriculturally the most important soil in the upland part of the county. To a depth of about 7 inches the surface soil is light brownish-yellow friable silt loam. This is underlain to a depth of about 12 inches by yellowish-brown silt loam which shows a slight tendency to form granules or little lumps. Below a depth of 12 inches is brownish-yellow granular heavy silt loam, which is uniform in color and texture to a depth of about 20 inches. The lower part of the subsoil consists mainly of yellowish-brown or yellow friable silt loam containing numerous sandstone fragments. The lower 4- to 6-inch layer of the subsoil is composed largely of highly weathered sandstone. Bedrock lies at a depth ranging from 30 to 36 inches. Angular fragments of sandstone occur on the surface and throughout the soil mass, the percentage of rock fragments in the soil being greater in the western than in the eastern part of the county.

Some areas have been included with this soil in mapping, in which numerous flaggy pieces of sandstone ranging from 2 to more than 4 inches in diameter, sufficient to interfere with agricultural operations, are on the surface. The soil in such areas, if of sufficient extent, would be classified as Muskingum stony silt loam. Also included with this soil are a few small areas in Green Township, especially on the ridge east of Ohio Furnace, where the soil is derived from a gray fire clay. It consists of a 3- to 6-inch layer of gray silty clay loam or clay, underlain by mottled gray and yellowish-gray clay continuing to a depth of more than 3 feet. In places the mottles in the subsoil are distinctly purple rather than yellow. These areas have been largely dug over

and commonly have a very rough surface. A striking feature is the presence of numerous sycamore trees, which is rather unusual on the upland. If more extensive, such areas would be shown as Eifort silt loam.

Areas of Muskingum silt loam occur throughout the county, but the most extensive ones are in Madison, Bloom, Vernon, and eastern Harrison Townships. This soil occupies ridge tops, shoulders, and the more gently sloping hillsides. It differs from Muskingum silt loam, steep phase, in topographic position, the steep phase occupying slopes too steep for the growth of the ordinary crops of the county. Drainage is good, and erosion may become a menace on the sloping areas if intertilled crops are grown frequently.

About 70 percent of this soil has been cleared, although only 25 or 30 percent is under cultivation, and about 20 percent is in permanent pasture. The principal crops include wheat, hay, corn, and some soybeans, rye, potatoes, and oats. Wheat yields from 12 to 15 bushels an acre under normal conditions, although yields of 18 to 20 bushels are sometimes obtained. Hay yields from 1 to 1½ tons an acre and corn from 25 to 35 bushels. Where farms on this soil include some bottom land, corn generally is grown on the bottom land rather than on the upland. Soybeans are grown largely for hay. Many of the farms on this soil include some areas of the steep Muskingum soil, some parts of which, along with parts of the typical soil, are in permanent pasture. The vegetation of the pastures commonly consists largely of poverty oatgrass, broomsedge, cinquefoil, and other weeds, and the pastures have a low carrying capacity. On some areas near Ohio River and near improved roads elsewhere, truck crops are grown on small areas for the local markets. Fruit growing has been developed to some extent on this soil which offers many ideal orchard sites with good air drainage.

In the fertilization of this soil superphosphate commonly is applied to wheat at a rate ranging from 150 to 200 pounds an acre. Many farmers have used bonemeal in the past, but, because of the high price of this amendment, it is being superseded by superphosphate. During recent years the 20-percent grade of superphosphate has come into common use. Some farmers use a complete fertilizer, such as 2-16-2 or 2-14-4, and for potatoes rather heavy applications of a complete fertilizer are common. Although this soil is uniformly acid, ground limestone has been used to only a small extent as a soil amendment, but undoubtedly a much better quality of hay could be obtained if limestone were used.

Muskingum silt loam, steep phase.—Muskingum silt loam, steep phase, includes, as its name indicates, the more hilly and steeper areas of Muskingum silt loam, which, because of their topographic position, are unsuited for general farming but are best adapted for permanent pasture or forestry. It includes numerous cultivated patches which, because of their small extent, could not be shown separately on the map. Steep areas of Muskingum silt loam with a slope of less than 45 percent are separated as a steep phase. Those with a slope of 45 percent or more are differentiated as a very steep phase. Included with the steep phase, at the bases of most of the slopes, are bands of colluvial soil of various widths, with a somewhat more gentle slope than the hillside above.

Muskingum silt loam, steep phase. is similar to the typical soil, except that the depth to bedrock is somewhat less, ranging from 24 to 30 inches, and the soil generally contains a larger proportion of small sandstone fragments.

The steep phase is very extensive throughout the county, especially in the north-central and southeastern parts, occupying 26 percent of the total land area. In Jefferson, Bloom, Vernon, and Green Townships about 20 percent of this steep land has been cleared and is used for permanent pasture; the remainder is in forest. Practically all of the land has been cut over and now supports a second-growth forest consisting of black oak, white oak, chestnut oak, scarlet oak, sassafras, and black gum.

With adequate protection from fire and attention to good forestry practice, this land will produce valuable crops of timber.

Muskingum silt loam, very steep phase.—The very steep phase of Muskingum silt loam occurs in the south-central part of the county, especially in Clay Township, and in the section west of Scioto River. Large areas of this very steep land are in Nile Township, where the proportion of flat ridge land and bottom land is very small, and little land associated with the very steep phase can be used for crop production. The total area exceeds that of the steep phase. It represents 35.1 percent of the total area of the county.

This soil occupies slopes, most of which exceed 45 percent gradient. It is very similar to the steep phase, except for its steeper slopes, but the depth of soil is somewhat less than in the steep phase. In the western part of the county, where the soil is derived largely from sandstone, decomposing sandstone occurs in many places at a depth ranging from 14 to 20 inches, and many sandstone fragments are on the surface and throughout the soil mass.

Not more than 5 percent of the land occupied by the very steep phase has been cleared. The rest, which originally supported a heavy forest growth, has been cut over but is now grown up to second-growth scarlet oak, white oak, chestnut oak, and black oak, with some scrub pine, pitch pine, and shortleaf pine mixed with the hardwoods, on the drier more exposed slopes. Tuliptrees grow in sheltered coves. Much of this land was burned over annually for years before the establishment of fire-control measures, but, since the establishment of the Shawnee State Forest and the appointment of local fire wardens throughout the territory, the fire hazard has been greatly reduced.

This land is best adapted for forestry. During the last few years a large tract in Nile Township and adjoining townships has been purchased by the State and is now included in the Shawnee State Forest, where methods of forest management applicable to this land are being investigated. With adequate management this land will produce crops of timber, just as the more level land produces crops of grain and hay.

Muskingum silt loam, colluvial phase.—Muskingum silt loam, colluvial phase, occupies narrow bands along the bases of hills where soil material from the hillside above has moved downward by slump and by wash and has accumulated at the base of the slope. Many such areas are of such small extent that they have been included on the map with areas of Muskingum silt loam, steep phase.

The surface soil of Muskingum silt loam, colluvial phase, to a depth of 6 or 8 inches, is light-brown or brown silt loam, somewhat darker than typical Muskingum silt loam, containing numerous angular and subangular sandstone fragments. The depth and color of the subsoil are variable, ranging from yellow practically stone-free silt loam to stony or gravelly silt loam. Included with areas of the colluvial phase as mapped are alluvial-fan areas, formed where small valleys or ravines adjoin the bottom lands, as a result of material brought down by running water and deposited along the valley sides, in places literally choking the outlet of the tributary valley. On most of the alluvial-fan areas the soil is deeper than in the narrow areas along the bases of slopes. In many places the soil is essentially a gravelly silt loam.

The areas of the colluvial phase are sloping but not so steeply sloping as the adjoining hillsides. Most of the land is well drained but, because of its gravelly nature, is not subject to serious erosion except where a stream channel may cross it and where, during hard rains, considerable material may be washed out and deposited on the alluvial fans.

Muskingum silt loam, colluvial phase, is commonly farmed in conjunction with the adjacent bottom land. It produces very good yields of corn, but generally not quite so large as those obtained on the bottom land. Most of the areas are used for small patches of potatoes and other vegetables, as they are well drained and are above ordinary floods. In many places, farmers in the valleys have utilized the colluvial areas for building sites.

Muskingum stony silt loam.—Muskingum stony silt loam differs from the steep and very steep phases of Muskingum silt loam in that numerous blocks of sandstone, ranging from 2 to more than 12 inches in diameter, are strewn over the surface. Practically all of this soil lies on steep or very steep slopes and, aside from its stoniness, is very similar to Muskingum silt loam, steep phase. It occupies slopes in the western part of the county at elevations where heavy bedded sandstone outcrops or comes near the surface. In a number of places, as near Buena Vista, sandstone quarries have been opened in the sandstone beds from which this stony soil has developed. Because of the steep relief and the stoniness of this soil it is of little or no agricultural importance, except possibly for forestry, and most of the land could be classed as rough stony land so far as its agricultural value is concerned.

In a few places Muskingum stony silt loam occupies ridge tops and gentle slopes, but because of the small extent of such areas they have been combined on the map with Muskingum silt loam.

Muskingum silty clay loam, steep phase.—Muskingum silty clay loam, steep phase, differs from the steep phase of Muskingum silt loam in texture. The 2-inch surface layer is grayish-brown silty clay loam. It is underlain by pale-yellow, yellowish-brown, or olive-yellow silty clay containing many shale fragments. Partly weathered shale occurs at a depth ranging from 24 to 48 inches.

This soil occurs near the bases of valley slopes along Pond Creek, Dry Run, and Carey Run and on some of the lower slopes facing the Scioto River Valley between Rushtown and Alexandria. It occupies slopes somewhat less steep than those occupied by Colyer shaly clay

loam, steep phase, but which, nevertheless, are too steep for general farming.

About 50 percent of this soil has been cleared, but it is used very little for any agricultural purpose except pasture. A few of the more level areas are under cultivation, but because of the heavy texture of the soil and the possibility of erosion, its use for cultivated crops is not recommended. The badly eroded area on the western side of Scioto River opposite Portsmouth shows very vividly the result of erosion on this land.

Colyer shaly clay loam, steep phase.—The most striking difference between Colyer shaly clay loam, steep phase, and Muskingum silty clay loam, steep phase, is in the depth to partly weathered shale and in the quantity of shale fragments on the surface and throughout the soil mass.

The 5- or 6-inch surface soil is brown or olive-brown heavy shaly clay loam. It is underlain by olive-gray or yellowish-olive heavy shaly clay loam or shaly silty clay streaked with yellow and gray. Below a depth of 12 or 14 inches is partly weathered shale. Shale fragments are common on the surface and throughout the soil mass, and in places sandstone blocks are strewn over the surface. In some areas, from which most of the soil has been removed by erosion, the surface soil is dark-gray shaly clay loam to a depth of 4 or 6 inches and is underlain by yellowish-olive shaly silty clay. Shale bedrock lies at a depth ranging from 8 to 12 inches. Throughout the higher parts of these areas the soil is deeper and does not contain fragments of black shale (Ohio shale), but rather fragments of bluish-gray shale (Bedford shale). The upper limit is marked by sandstone ledges (Berea sandstone).

This soil occurs in small areas on the valley slopes near the western county line, where the outcropping belt of Ohio shale extends into Scioto County from Adams County and is exposed in Scioto County only on the lower valley walls. Blocks from the overlying sandstone have rolled down the slopes and are strewn over the surface. The soil characteristic of the shale formations in many places is obscured by surface material made up of slump from the overlying sandstone formations and resembles the surface soil of the steep phase of Muskingum silt loam. Most of the areas mapped in Scioto County occupy an intermediate position between the very steep slope above and a more gentle slope below. The lower slope is comprised partly of colluvial slump from the formations above.

Practically all of this soil is forested. Some of it has been cleared and then allowed to revert to forest. As a result of forest fires the cover of vegetation is very sparse, exposing the surface to erosion so that nearly all of the soil material has been removed in many areas. This steep land has no agricultural value other than for forestry and should be used only for that purpose.

Muskingum loam.—Muskingum loam differs from Muskingum silt loam chiefly in the texture of the surface soil. The light-brown friable loam surface soil, ranges from 5 to 7 inches in thickness. It is underlain by yellowish-brown heavy loam which rests on sandstone bedrock at a depth ranging from 20 to 30 inches. Small sandstone fragments are numerous on the surface and throughout the soil mass.

In the area near Oak Ridge School, shown on the map by gravel symbols, numerous rounded quartz pebbles are distributed throughout

the surface soil and subsoil. Also included with this soil as mapped are a few areas near sandstone outcrops where the texture is sandy loam, and the soil is somewhat more yellow than is typical Muskingum loam.

This soil is developed in the eastern part of the county where it occupies ridge tops and, in a few places, lower slopes in association with Muskingum silt loam. The total area is small. The largest areas are in northeastern Madison Township, and smaller areas are in Bloom, Vernon, and Green Townships. The relief is gently rolling to rolling, and natural drainage is good. A few areas of Muskingum loam occupying steep slopes are included with the steep phase of Muskingum silt loam in mapping.

About 25 percent of this soil is farmed, and the rest is used either for permanent pasture or woodland. The principal crops are corn, wheat, and hay. Corn yields from 25 to 35 bushels an acre and wheat 15 to 20 bushels. Good yields of potatoes are obtained. Because of its open porous structure, the soil leaches readily and is very acid. Pastures are poor, as the vegetation consists largely of poverty oat-grass and broomsedge. This soil should be more desirable for truck crops than is Muskingum silt loam.

Rarden silt loam.—Rarden silt loam differs from Muskingum silt loam chiefly in the somewhat red color and heavier texture of the lower part of the subsoil and in the greater average depth of the soil mass. The surface soil is light-brown friable silt loam, to a depth of 6 or 7 inches, and this is underlain by yellowish-brown silt loam to a depth of 10 or 12 inches. Below this is yellowish-brown heavy granular silt loam which, at a depth of about 14 inches, is slightly mottled with light gray. The lower part of the subsoil, below a depth of 18 or 20 inches, consists of heavy plastic silty clay loam mottled with yellow, gray, and yellowish red. The material in this layer breaks into fragments, from $\frac{1}{2}$ to 1 inch in diameter, which are coated with gray or yellowish gray. The red and yellow colors are irregularly distributed throughout the fragments. This material extends to a depth ranging from 30 to 40 inches, below which is bedrock consisting of clay shale, shale, and sandstone. This soil is very acid in reaction.

Rarden silt loam occurs in the western and northwestern parts of the county where it occupies the ridge tops and, in a few places, the gentle slopes below the highest ridges, as in the area just west of Sedan in Morgan Township. The soil, in general, occupies gently rolling to rolling areas, and most of it is naturally well drained. The largest area is near Mount Joy in Rarden Township. In places a narrow belt of Muskingum stony silt loam is just below the ridge-top areas of the Rarden soil, where a massive sandstone formation occurs near the top of the steep hillside.

In the rough hilly area west of Scioto River, a large proportion of the upland that is used for general farming consists of Rarden silt loam. About 70 percent of the soil is under cultivation, and most of the remainder is used for pasture. The chief crops grown are corn, wheat, oats, and hay. Corn yields from 35 to 50 bushels an acre; wheat, 12 to 15 bushels; oats, 20 to 30 bushels; and hay, 1 to $1\frac{1}{2}$ tons. It is the common practice to place whatever manure is available on the land devoted to corn and potatoes, and on some

farms this is supplemented by an application of superphosphate or, more commonly, by a complete fertilizer. For wheat, a complete fertilizer generally is used.

Because of the acid condition of the soil, liming is necessary for the growth of legumes, such as red clover or alfalfa. Potatoes are grown on a small acreage on most farms. A number of small dairies are operated on this soil, and several orchards are located on it. With the improvement of the main roads, it is possible to transport by autotruck the produce for the local market at Portsmouth or for shipment to Cincinnati or Columbus. In agricultural value, Rarden silt loam is comparable to the best areas of Muskingum silt loam. Most farms on this soil include considerable land of the steep phases of the Muskingum soils, hence the value of the farms is determined by the proportions of the various classes of land included.

Rough broken land.—Rough broken land includes small, rough, irregular, or steep areas of stony land with numerous rock ledges or rocky cliffs. Such areas are wholly unfit for agriculture, with the exception, possibly, of small patches that afford some pasture. They should be left in forest.

The principal bodies included in this classification occur on the slopes along Ohio River, and several areas are east of Portsmouth, near New Boston, and west of Scioto River between Buena Vista and Friendship.

SOILS OF THE HOLSTON GROUP

Holston silt loam.—The surface soil of Holston silt loam is brown friable silt loam to a depth of about 8 inches, where it is underlain by pale-yellow or yellowish-brown heavy silt loam. Where areas of this soil join the soils of the upland, the surface soil in places contains some sandstone and shale fragments washed from the slopes above. Below a depth of 14 or 16 inches, the subsoil is yellow granular silty clay loam, to a depth ranging from 24 to 30 inches, underlain by pale-yellow silty clay loam. The lower part of the subsoil and substratum are somewhat variable. In a cut on the Chesapeake & Ohio Railway near Minford, at a depth of 4 feet, is mottled pale-yellow and gray silty clay. Below a depth of 10 feet, the material consists of laminated silt and clay and extends, in one place, to a depth of 40 feet below the surface, although in most places the depth to bedrock is not more than 20 feet. In places the lower part of the subsoil contains thin lenses of sand.

Included with this soil as mapped are areas of a shallow phase, in which bedrock occurs at a depth ranging from 20 to 30 inches, but because of their small extent, they have been included with the typical soil. Such areas occur along Little Scioto River northwest of Glade School in Madison Township near the county line. This included soil is acid in reaction.

Holston silt loam occupies flats in the best drained part of old valley fills, high terraces, and second bottoms, where the underlying material is made up largely of slack-water deposits consisting of laminated silts and clays. The most extensive areas occur in California Valley in the east-central part of the county, where it is associated with areas of Monongahela silt loam. It is best developed near the southern end of the valley, a short distance from the Ohio River Valley, where California Valley is much dissected and conditions are favorable for the

good natural drainage that characterizes this soil. Other areas in the eastern part of the county are near South Webster, on the old valley floor east of Lucasville, and north of Lucasville near the county line. West of Scioto River areas of Holston silt loam occur near Sedan, north of McDermott, and near Rushtown; and several areas, such as those near Friendship and Pond Run, are on high terraces along the border of the Ohio River Valley in the southwestern part of the county.

The relief of Holston silt loam ranges from almost level to strongly undulating, and natural drainage is good. About 65 percent of this soil is under cultivation, and, because of its favorable relief and good natural drainage, it is well adapted to the growth of cultivated crops. Corn, wheat, and hay are the principal crops. Corn yields from 35 to 40 bushels an acre, wheat from 12 to 20 bushels, and hay about 1½ tons. Soybeans are grown for hay by a number of farmers. Potatoes yield from 100 to 150 bushels an acre. Because of the acid condition of the soil, liming is required, in order to obtain a good stand of clover. Truck cropping and fruit growing, especially of small fruits, are common on some areas near Ohio River.

Holston silt loam, slope phase.—Holston silt loam, slope phase, includes the steep slopes which have been eroded in material similar to that from which the Holston soil is derived. The surface soil, to a depth of 8 inches, is brown silt loam. This is underlain by yellow or yellowish-brown silty clay loam to a depth of 18 or 20 inches, below which is yellowish-brown silty clay loam that continues to a depth of more than 3 feet.

Soil of this phase differs from soil of the steep phase of Muskingum silt loam in that it is essentially free from sandstone fragments and in most places is much thicker. In general the slopes are not so steep as the slopes of the Muskingum soil. The most extensive areas are southeast of Sciotoville and east of Lucasville.

About 30 percent of this soil has been cleared and is used principally for permanent pasture, and of the remainder, which is forested, about one-half is also used for pasture. Because of the steep slopes occupied by this soil, permanent pasture is probably the best use that can be made of all except the steepest areas, which should remain in forest. Erosion is severe when intertilled crops are grown.

Holston loam.—Holston loam differs from Holston silt loam in the texture of both the surface soil and subsoil. The surface layer consists of brown or grayish-brown friable loam. The texture is somewhat variable, ranging from fine sandy loam to heavy loam. Below a depth of 7 or 9 inches is yellowish-brown light loam or fine sandy loam, which passes, at a depth ranging from 14 to 18 inches, into yellowish-brown heavy loam with a red cast. The subsoil, below a depth of 24 inches, ranges from yellowish-brown sticky sand to light sandy loam. The underlying material is somewhat variable in texture but in most places is sandy. Included with this soil as mapped, because of their small extent, are areas of fine sandy loam and very fine sandy loam, which differ from the typical soil only in texture of the surface soil.

This soil is much less extensive than Holston silt loam. It occurs only in a few small areas near Purdy Corners, along Miller Run 2 miles north of Lucasville, and about 1 mile northeast of Friendship. It occupies level to gently undulating areas and has excellent drainage.

About 80 percent of the land is cleared and used for the production of crops. It is farmed much like Holston silt loam, but because of its

sandy character it is used for the growing of potatoes and to some extent for truck crops. The sandier areas tend to be somewhat droughty. In general, yields are lower than on Holston silt loam.

Monongahela silt loam.—Monongahela silt loam is the second most extensive terrace soil in the county. It is one of the most important agricultural soils. It differs from Holston silt loam in that it is not quite so well oxidized as the latter, the lower part of the subsoil showing some mottling as a result of imperfect underdrainage. The surface soil, to a depth of 7 or 8 inches, is light-brown or grayish-brown friable silt loam. This is underlain, to a depth of 14 or 16 inches, by pale yellowish-brown silt loam which becomes somewhat heavier with depth. Below this is compact somewhat plastic silty clay loam mottled with grayish yellow, brown, and gray, which extends to a depth ranging from 26 to 30 inches, and below this depth the texture is somewhat lighter. The underlying material is very similar to that underlying Holston silt loam. It consists of beds of stratified silt, clay, and very fine sand. The entire soil material is acid in reaction.

Several small areas of a shallow phase of this soil, in which bedrock occurs at a depth ranging from 24 to 30 inches, are included in mapping. Because of their small extent, they are not shown separately.

This soil is widely distributed on terraces in old valleys and as more or less isolated areas along the sides of the present valleys, at considerable elevation above the level of the streams. Its most extensive development is in California Valley, where it is the predominating soil. Other important areas are east of Lucasville, west of Stringtown, near South Webster, near Lyra, and along Pine Creek in the eastern part of the county; and near Sedan, Crabtree, and along Scioto Brush Creek west of Scioto River. More or less isolated areas occur in various parts of the county. In California Valley fairly continuous areas extend for a distance of several miles, but elsewhere the bodies range in size from about 30 or 40 acres to 1 square mile, and many of them are rather small and isolated.

About 80 percent of this soil is under cultivation, 15 percent in permanent pasture, and 5 percent forested. Because of its favorable relief, it is one of the most important general farming soils in the county. Many farms include some hill land, which is used for pasture, and the level terrace land is used for intertilled crops. The relief is gently undulating or level. Many areas have good surface drainage, but, as a result of the rather heavy subsoil, underdrainage is only fair.

All the general farm crops of the section are grown on this soil. Corn, wheat, potatoes, soybeans, and hay are important. With adequate liming alfalfa yields fairly well, and yields of all crops are about the same as on Holston silt loam. Most farmers on this soil keep a few cows and hogs. It is the common practice to use the available manure on the land for corn or potatoes and to supplement this with an application of 20-percent superphosphate, but some farmers use a complete fertilizer for potatoes. Wheat is fertilized with superphosphate. Some form of lime is used by many farmers, in order to improve the quality of the hay crop, through an increase of legumes in the hay mixture, or to obtain a stand of alfalfa. Tile drains have been installed on a few farms, especially where this soil

is associated with Tyler silt loam. Artificial drainage is desirable on a considerable part of the land.

Tyler silt loam.—Tyler silt loam differs from Monongahela silt loam in that it occupies somewhat more level areas and hence is not so well drained. The surface soil, to a depth of 8 inches, is light grayish-brown friable silt loam. This is underlain by mottled yellowish-brown and light-gray silt loam which becomes more compact with depth. Numerous small iron concretions occur throughout the surface soil and subsurface soil. Below a depth of 16 or 18 inches is mottled brownish-yellow and gray heavy compact silty clay loam containing some rust-brown iron concretionary material. From a depth of 30 inches to a depth of 48 inches is mottled yellowish-brown, rust-brown, and gray heavy and somewhat compact silt loam or light silty clay loam. The substrata consist of laminated silt and clay.

This soil occurs chiefly in California Valley, especially north of Minford, in association with Monongahela silt loam, where it occupies level areas. Both surface drainage and underdrainage are poor. The soil is acid in reaction.

About 75 percent of this soil is used for the production of crops, 15 percent for permanent pasture, and 10 percent is forested. Although some areas have been tiled, the chief dependence for drainage is by shallow surface ditches, which aid in removing the surface water. The chief crops are corn, wheat, rye, buckwheat, and hay. Because of the poor natural drainage, crop yields are below those obtained on Monongahela silt loam, especially in wet years. In general, the quality of the hay and pasture is poor, as desirable grasses and legumes do not do well on this very acid soil. Liming and fertilizing will greatly improve the meadows.

Purdy silt loam.—Purdy silt loam differs from the Tyler soils in that the surface soil is light gray and the subsoil is highly mottled throughout, as a result of very poor natural drainage. The surface soil, to a depth of 7 inches, is light-gray friable silt loam containing some small rust-brown iron concretions. This is underlain, to a depth of 14 inches, by very light gray silt loam streaked with rust brown. Numerous iron concretions ranging in size from that of bird shot to that of a pea are distributed through this layer. The upper part of the subsoil, to a depth of 18 or 20 inches, is mottled light-gray and brownish-yellow heavy silt loam grading into mottled compact silty clay loam which breaks into fragments ranging from $\frac{1}{2}$ to 1 inch in diameter. Below a depth of 30 inches is mottled gray and yellowish-brown light silty clay loam containing some rust-brown soft concretionary material. The substratum is similar to that of the Holston, Monongahela, and Tyler soils.

Purdy silt loam occupies flat and depressed areas on terraces, in association with Monongahela silt loam and Tyler silt loam. The largest areas are in California Valley near the northern county line. Both surface drainage and underdrainage are very poor, and the soil is very acid.

About 75 percent of this soil has been cleared, and about one-half of the cleared land is used for pasture or meadow. As a result of the poor drainage and a very acid condition, the soil commonly supports a very poor type of pasture grasses. Artificial drainage and liming are the first essentials in the utilization of this soil. Fair

crops of corn are produced, with yields ranging from 25 to 30 bushels an acre. Some rye and buckwheat are grown. Probably the best use for this soil is as hay and pasture land, although the quality of grass is poor unless the land is limed. In some parts of California Valley beds of slack-water clay, which greatly impede the movement of water through the soil, occur at a rather slight depth. The poor natural drainage of these areas is the result of the very impervious subsoil.

Included with mapped areas of this soil are bodies along Scioto Brush Creek near McDermott, where the surface texture is heavy silt loam, but the subsoil at a depth of 12 or 15 inches is very heavy silty clay. Because of the heavy impervious subsoil, these areas have much poorer natural drainage than might be expected from their topographic position. Several small areas of Purdy clay loam also are included on the map with Purdy silt loam.

SOILS OF THE WHEELING GROUP

Wheeling silt loam.—Wheeling silt loam is confined to the higher terrace levels along Ohio River and is subject to overflow only at times of extreme flood. It occupies level to gently sloping areas. The surface soil, to a depth of 8 or 10 inches, is brown or dark-brown friable silt loam containing numerous small flakes of mica, and it is acid in reaction. This is underlain by yellowish-brown silt loam to a depth of 17 inches. Between depths of 17 and 24 inches is granular rather compact heavy silt loam. The material in this layer breaks into fragments that are yellowish brown for the most part but are coated with reddish-brown material, thereby giving a decidedly red cast to the upper part of the subsoil. The lower part of the subsoil, below a depth of 24 inches, is brown heavy silt loam with a red cast, but it is somewhat lighter in texture than the material in the horizon above. This grades into loam at a depth ranging from 50 to 60 inches. Deep cuts show a succession of beds of silt and very fine sand. Below a depth ranging from 8 to 10 feet, the material consists of beds of stratified sand and gravel. On low ridges where drainage is excellent, the red cast is somewhat more pronounced than on the more nearly level areas. In places where this soil borders areas of Scioto silt loam, a slight streaking with yellowish gray is evident in the lower part of the subsoil. South of Friendship a few bodies are included with this soil in mapping, in which the surface soil is somewhat heavier than typical, that is, silty clay loam.

This soil, which is naturally well drained, generally is farmed in connection with Scioto silt loam and is considered one of the best soils in the county. It is used chiefly for general farming, although in the vicinity of Portsmouth truck crops are grown to a considerable extent. It is a very good soil for the production of corn, yields of which range from 50 to 60 bushels an acre. Most farmers use all available manure and some fertilizer on the cornland. Wheat yields from 15 to 20 bushels. Oats are not grown extensively, as ordinarily the yields are only fair. Mixed hay yields from $1\frac{1}{2}$ to 2 tons an acre. With applications of lime, clover and alfalfa make an excellent growth. Some soybeans are grown. This is considered a good soil for potatoes, which yield from 150 to 200 bushels an acre. Land for potatoes usually is manured heavily, and this treatment is supplemented with from 800

to 1,000 pounds or more of fertilizer, such as 3-8-6. Some tobacco is grown west of Portsmouth, where yields ranging from 800 to 1,000 pounds an acre are produced. The quality is considered not so good as that of tobacco produced on limestone land in Adams County. A variety of truck crops is produced, for which Portsmouth and Ironton furnish a very good market. Dairying is an important branch of agriculture on this soil.

Wheeling loam.—Wheeling loam is of very small extent. A small area occurs near Haverhill, and several small bodies are west of Portsmouth between Friendship and Buena Vista.

The surface soil is brown friable loam, to a depth of 10 inches, and this is underlain by yellowish-brown silt loam. Below a depth ranging from 14 to 18 inches the subsoil is similar to that of Wheeling silt loam.

This soil is naturally well drained, and because of its sandy character crops may be sown somewhat earlier than on Wheeling silt loam. In general, the same crops are grown as on Wheeling silt loam and yields are about the same. This soil is especially well adapted to truck crops. Potatoes produce somewhat higher yields than on Wheeling silt loam.

Sciotosville silt loam.—Sciotosville silt loam is somewhat more extensive in the broader parts of the Ohio River terraces than are the Wheeling soils. This soil differs from the Wheeling soils in that it does not have such perfect underdrainage, as indicated by the mottled color of the lower part of the subsoil. This soil occupies the more level areas in the broader parts of the terraces and is subject to overflow only at extreme flood stages. It is somewhat more acid in reaction than Wheeling silt loam.

The surface soil, to a depth of 8 or 10 inches, is brown friable silt loam. This is underlain by yellowish-brown compact silt loam. Below a depth ranging from 14 to 18 inches the subsoil is yellowish-brown heavy and more or less compact silt loam mottled with yellowish gray, and at a depth of 30 inches it grades into mottled yellowish-brown and gray silty clay loam. As in the Wheeling soil, stratified gravel and sand occur at a depth ranging from 8 to 10 feet, but in the Sciotosville soil the water table is somewhat higher and, therefore, underdrainage is not so good. West of Friendship, areas indicated on the map by gravel symbols have a slight overwash of sandstone gravel carried in by nearby streams.

About 85 percent of this soil is under cultivation. It is farmed in connection with the Wheeling soils, and about the same crops are grown. Owing to the poor underdrainage, yields are lower than on Wheeling silt loam, and artificial drainage is desirable. As the soil is somewhat more acid than Wheeling silt loam, heavier applications of limestone are required for the growth of clover and alfalfa than are needed on the Wheeling soil.

Sciotosville silt loam as mapped includes small areas of a soil that differs from the typical soil in that it is naturally not so well drained, as indicated by the high degree of mottling throughout the subsoil. It occupies small level or slightly depressed areas throughout the Ohio River terraces. The surface soil is grayish-brown silt loam, to a depth of 8 or 10 inches, underlain by mottled grayish-brown and yellowish-brown compact silt loam to a depth ranging from 12 to 16 inches. This rests on mottled yellowish-brown, gray, and rust-brown heavy silt

loam, which extends to a depth of 30 inches, below which is yellowish-brown silt loam containing numerous rust-brown streaks.

About 75 percent of this included soil is under cultivation. Artificial drainage is required before the land can be used for most cultivated crops. Very good yields of hay are produced, although liming is required for the production of clover and alfalfa. This soil is not very desirable for tobacco or potatoes, which are grown successfully on the better-drained terrace soils. Occurring as it does in long narrow areas paralleling the river, it is difficult, in places, to obtain the desired fall and outlet for tile drainage. In a few places tile drains empty into a cistern leading down to the underlying porous gravel and sand sub-strata, thus providing an adequate outlet. This system should give satisfactory drainage, provided the water table in the gravel is sufficiently low during most of the year.

Ginat silt loam.—Ginat silt loam occupies the level or slightly depressed areas in the broader parts of the Ohio River terraces. Natural drainage of this soil is very poor. The surface soil is light-gray silt loam to a depth of 6 or 8 inches, and this is underlain by mottled gray, rust-brown, and yellowish-brown silt loam. Below a depth of 16 inches is mottled gray, yellowish-brown, and rust-brown more or less compact silty clay loam which continues to a depth of 30 inches. The lower part of the subsoil is mottled yellowish-brown and gray silty clay loam. This soil is very acid in reaction.

About 60 percent of the land is under cultivation, and the rest is used for hay and pasture land. Artificial drainage is required before this soil can be used for crops, and even with adequate drainage it is of moderate or low productivity. In many areas it is difficult to obtain a satisfactory outlet for tile drains. Corn and hay are the principal crops. Soybeans produce fair yields. Probably the best use for this soil is as hay and pasture land.

Ginat silty clay loam.—Ginat silty clay loam differs from Ginat silt loam in that it is much finer in texture throughout the entire soil mass. It is naturally more poorly drained and because of its heavy texture is more difficult to drain adequately by tiling. It occupies level or depressed areas in the broader parts of the Ohio River terraces.

The surface soil, to a depth of 7 inches, is gray silty clay loam with a fine-granular structure. This is underlain by mottled light-gray, yellow, and rust-brown heavy silty clay loam or silty clay. Below a depth of 30 inches is mottled yellowish-brown and gray heavy silty clay loam. This soil is very acid to a depth of more than 4 feet. Included in mapping are a few small areas between Franklin Furnace and Haverhill where the surface soil is heavier than typical, that is, a silty clay.

About 60 percent of this soil is under cultivation, and the rest is used as hay and pasture land. Where artificially drained, fair yields of corn and hay are produced. In some fields shallow surface drains (dead furrows) are used to remove the surface water. The areas of heavier soil are rather difficult to drain by tiling and commonly are left in pasture.

Fox silt loam.—Fox silt loam occurs in several small areas on low terraces along the borders of the Scioto River Valley. The village of Lucasville is situated on the largest area.

The surface soil is brown friable silt loam to a depth of 8 or 10 inches, underlain by light-brown silt loam which continues to a depth

of 14 inches. The subsoil is yellowish-brown silty clay loam with a red cast. Stratified beds of calcareous sand and gravel occur at a depth ranging from 30 to 40 inches. Immediately above the gravel the subsoil is dark-brown sandy clay. The soil is naturally well drained. In general it is slightly acid in reaction.

A considerable proportion of this soil along the main highways is used for building lots and gardens. Very good crops of corn and wheat are produced. Alfalfa does especially well, although some areas are sufficiently acid to require liming for the best success with this crop.

Fox loam.—Fox loam occupies a few small areas along the borders of the Scioto River Valley. The largest area is on the western side of the valley near the mouth of Pond Creek.

The surface soil, to a depth of 6 inches, is brown friable loam, and this is underlain by yellowish-brown heavy loam to a depth of 10 or 12 inches. Below this is yellowish-brown or reddish-brown sandy clay loam resting on stratified gravel and sand at a depth ranging from 2 to 3 feet. Some gravel is on the surface and throughout the surface soil and subsoil. The gravel contains a smaller proportion of limestone than is characteristic of the gravel farther north in Scioto River Valley. The subsoil is not so reddish brown as is that in the more typical Fox soils farther north. Drainage is excellent.

Practically all of this soil is under cultivation. The larger areas are used for the production of corn, wheat, and hay. Corn yields from 35 to 40 bushels, wheat 20 bushels, and hay about 1½ tons an acre. Good yields of alfalfa are produced. Some areas are used for truck gardening, for which the land is very well adapted.

Mill Creek silt loam.—Mill Creek silt loam differs from Fox silt loam in that it is not so well drained naturally, probably as a result of the greater depth to the underlying gravel. The color of the soil material is somewhat similar to that of Monongahela silt loam. To a depth of 6 or 8 inches, the surface soil is grayish-brown friable silt loam, and this is underlain by yellowish-brown heavy silt loam or light silty clay loam. Below a depth of 12 inches the subsoil is pale-yellow silty clay loam streaked with gray, and at a depth of 22 inches it is mottled yellowish-brown and gray compact silty clay loam, which extends to a depth of more than 3 feet. Stratified gravel and sand occur at a depth ranging from 5 to 8 feet.

Areas of this and other terrace soils in Scioto River Valley are commonly used for building sites on farms which include large areas of the adjacent alluvial soils used chiefly for the production of corn. A considerable proportion of the terrace soil is left in pasture or is used as feed lots for livestock. Adjacent to the main highway a considerable area is taken up in small allotments where some truck crops are produced. The cultivated areas on the larger farms are used for the production of corn, wheat, and hay. Yields are somewhat lower than those obtained on Fox silt loam.

Homer silt loam.—The surface soil of Homer silt loam is brownish-gray or gray silt loam to a depth of 7 or 8 inches. This is underlain by mottled gray and yellowish-brown silt loam to a depth of 12 or 14 inches, below which the texture becomes silty clay loam, and the material is mottled. Gravel and sand occur at a depth ranging from 40 to 60 inches.

This soil occupies low terraces along the borders of Scioto River Valley. Natural drainage is poor. A considerable proportion of these areas is used for small allotments and building sites, along with areas of other soils. The larger areas are used for general farming. Because of the poor natural drainage, yields are considerably below those obtained on Mill Creek silt loam.

SOILS OF THE ALLUVIAL BOTTOM LANDS

Genesee silt loam.—Genesee silt loam is the most extensive alluvial soil in the Scioto River bottoms, or flood plain. The surface soil is brown or dark-brown friable silt loam to a depth of 12 or 14 inches. This is underlain by yellowish-brown heavy silt loam or light silty clay loam, which commonly shows little variation to a depth ranging from 2 to 3 feet. Near Scioto River the surface soil is somewhat sandy and approaches a loam in texture. In places the lower part of the subsoil, below a depth ranging from 24 to 30 inches, is yellowish-brown loam. The soil is approximately neutral in reaction. Included with this soil in mapping are a few very small areas where streams emptying from side valleys have deposited some overwash of acid sandstone material similar in character to the Pope soils.

Practically all of this soil is under cultivation and is used largely for the production of corn, yields of which range from 50 to 75 bushels an acre. The dark-brown inclusions are most excellent soil for corn. It has been the custom to grow corn year after year without the use of manure or fertilizers, and it is reported that yields are decreasing somewhat. Alfalfa grows luxuriantly and yields from 3 to 4 tons an acre. As the land is flooded nearly every year, this soil is not satisfactory for the growth of small-grain crops, although some oats are seeded and return satisfactory yields in favorable years. About 15 percent of the soil is used for pasture.

This soil, together with the other soils of the broad Scioto River bottoms, is commonly farmed in connection with the terrace or upland soils along the valley sides. This great area of excellent corn-land produces a large crop of corn nearly every year, which adds greatly to the total value of the agricultural products of the county.

Genesee silt loam, high-bottom phase.—Genesee silt loam, high-bottom phase, occupies areas slightly above the general level of areas of the typical soil and are not subject to such frequent flooding. This soil is very similar to the typical soil, but it shows a somewhat greater degree of compaction in the subsoil. Because of its more favorable topographic position, a somewhat larger proportion of the high-bottom phase is used for alfalfa and for grain, although corn is the principal crop.

About 75 percent of this soil is farmed in connection with typical Genesee silt loam. Corn is the crop commonly grown, and yields are somewhat less than on typical Genesee silt loam or Genesee loam. Excellent yields of mixed hay and of alfalfa are produced.

Included with this soil in mapping are some areas in which the material is dark brown. These inclusions are the most fertile soils in the Scioto River bottoms and produce the largest yields of corn.

Genesee fine sandy loam.—Genesee fine sandy loam occurs chiefly along Scioto River, where it exists as natural levees. The surface soil to a depth of 8 or 10 inches is medium-brown fine sandy loam, and it is underlain by yellowish-brown fine sandy loam or loamy

sand. In many places this rests on silt loam material at a depth ranging from 20 to 24 inches. In many areas some gravel is scattered over the surface, and the very gravelly areas are indicated on the map by gravel symbols.

About 50 percent of this soil is under cultivation and is farmed in connection with Genesee silt loam, and the rest, mainly areas bordering Scioto River, is in brush or forest. Corn, the principal crop, returns slightly lower yields than those obtained on Genesee silt loam.

Included with this soil as mapped are several areas of somewhat darker fine sandy loam occurring on the high bottoms. These bodies, because of their small extent, are not shown separately.

Genesee loam.—Genesee loam differs from Genesee silt loam chiefly in the somewhat more sandy texture of the surface soil. It consists of brown loam to a depth of 12 or 15 inches, where it is underlain by brown or yellowish-brown loam or silt loam to a depth of 36 or more inches. Some areas have a sandy overwash deposited on Genesee silt loam, and elsewhere the soil occupies natural levees along Scioto River. About 75 percent of the land is cropped and is used chiefly for the production of corn. Yields are somewhat lower than on Genesee silt loam.

Genesee silty clay loam.—Genesee silty clay loam includes soils of the Scioto River bottoms that are somewhat heavier in texture than Genesee silt loam. The color of the two soils is very similar. Genesee silty clay loam differs from Huntington silty clay loam, which occurs near the mouth of Scioto River, in that it does not contain the quantity of mica characteristic of the alluvial soils along Ohio River. The surface soil, to a depth of 10 or 12 inches, is dark-brown silty clay loam. This is underlain by brown silty clay loam to a depth of 3 feet or more. This soil is not quite so well drained naturally as is Genesee silt loam.

Genesee silty clay loam occurs in small areas in close association with Genesee silt loam, and it is farmed in much the same way, with corn as the most important crop.

Eel silt loam.—Eel silt loam, which is of very small extent, is not so well drained naturally as is Genesee silt loam. It occupies low-lying areas in the Scioto River bottoms. The 10- or 12-inch surface soil is brown or grayish-brown silt loam. It is underlain by a mottled brown and yellowish-brown silty clay loam subsoil containing numerous rust-brown streaks. About 50 percent of this soil is used for the production of corn, and the rest is in permanent pasture. Where adequate drainage is provided by tiling, yields ranging from 35 to 50 bushels of corn an acre are produced.

Wayland silt loam.—Wayland silt loam, which is very inextensive, occupies long narrow low depressions and old drainageways in the Scioto River bottoms. The surface soil is brownish-gray heavy silt loam to a depth of 8 or 10 inches, and this is underlain by mottled bluish-gray and yellow silty clay loam streaked with rust-brown material. Natural drainage is very poor. Most of the land is used for pasture.

Huntington loam.—Huntington loam occupies a narrow belt of first-bottom land along Ohio River. The surface soil is variable, ranging from fine sand to clay loam, although the loam predominates, and from brown to dark brown. At a depth of 8 or 10 inches the

color changes to light brown or yellowish brown, which continues without much change to a depth of more than 2 feet. The land is subject to annual overflow. Drainage is good.

Only about 50 percent of this soil is used for crops. Much of the area adjacent to Ohio River is in forest consisting principally of willow, with some sycamore. Corn, alfalfa, and truck crops are grown. Corn produces very heavy yields.

Huntington loam, high-bottom phase.—Huntington loam, high-bottom phase, consists of a 10-inch layer of brown loam underlain by yellowish-brown heavy loam which extends to a depth of about 36 inches without much change. This soil occurs on the high bottom near the mouth of Scioto River, where it occupies a low ridge slightly above the elevation of the surrounding area. The land is well drained. It is farmed in connection with the adjacent areas of heavier textured Huntington soil, and the same crops are grown on the two soils.

Huntington silty clay loam.—Huntington silty clay loam occurs in the lower Scioto River Valley near Ohio River, where it occupies the first bottom and is subject to annual overflow. The surface soil is brown or dark-brown light silty clay loam to a depth ranging from 12 to 18 inches, below which is light-brown silty clay loam that continues to a depth of 36 or more inches. As mapped this soil includes several small areas in which the texture of the surface soil is silt loam which, although heavy, is fairly friable because of its high content of organic matter, and clods crush fairly easily. This soil is used almost exclusively for the production of corn, which produces high yields.

Huntington silty clay loam, high-bottom phase.—Huntington silty clay loam, high-bottom phase, occupies areas slightly above the general level of the flood plain, and it is not subject to such frequent flooding as are the lower lying soils. It is very similar to typical Huntington silty clay loam but shows somewhat greater compaction in the subsoil. Corn is the chief crop grown, and some alfalfa and mixed hay are produced. Very good yields are obtained.

Linside silty clay loam.—Linside silty clay loam occurs near the mouth of Scioto River, where it is influenced by alluvium deposited from Ohio River. It is subject to annual inundation. The surface soil to a depth of 10 or 12 inches is grayish-brown silty clay loam. This is underlain by yellowish-brown silty clay loam streaked with gray and containing some rust-brown concretionary material. The subsoil continues without much change to a depth of 3 feet or more. This soil is not so well drained naturally as is Huntington silty clay loam. It is neutral in reaction. Practically all of it is under cultivation and is used almost exclusively for the production of corn, which yields well except in wet years.

Melvin silty clay loam.—Melvin silty clay loam occurs in depressions and old stream channels in the lower Scioto River Valley, in association with Huntington silty clay loam and Linside silty clay loam. The surface soil to a depth of 10 or 12 inches is brownish-gray or dark-gray silty clay loam. This is underlain by mottled gray and yellowish-brown silty clay loam. This soil is naturally very poorly drained, and, after floods, water commonly stands in the low-lying areas for a considerable period of time. Practically none of this soil is used for the production of crops. Much of the land

is covered by coarse grasses, cattails, and similar vegetation. A small proportion is used for pasture.

Riverwash.—Riverwash includes several areas along Scioto River where sand and gravel recently have been deposited. Most of the areas, because of their recent deposition, are devoid of vegetation and are of no agricultural value.

Pope silt loam.—Pope silt loam, to a depth of 7 inches, consists of brown or light-brown friable silt loam which is acid in reaction and contains some rounded and angular sandstone fragments. This is underlain by brownish-yellow silt loam carrying a considerable quantity of very fine sand. Below a depth of 18 inches and extending to a depth of more than 36 inches the texture changes little, but the color ranges from brownish yellow to pale yellow. The content of sandstone fragments is variable, and where these are very numerous the areas are shown on the map as Pope gravelly silt loam.

Pope silt loam occurs in all parts of the county on the flood plains of streams tributary to Ohio and Scioto Rivers. The areas range considerably in size, from narrow bands in the small valleys to strips of considerable width along some of the larger streams where the soil is associated with the Philo and Atkins soils. The surface is nearly level, and the soil is naturally well drained, although it is subject to annual inundation.

About 80 percent of this soil has been cleared and is farmed or used for pasture. Corn and hay are the principal crops, and some wheat is grown. Corn yields from 25 to 35 bushels an acre, and hay from 1½ to 2 tons. Wheat yields range from 12 to 18 bushels an acre, but spring floods may damage wheat considerably. Summer floods are not so common but occasionally cover the cornland in midsummer. Some tobacco is grown on the higher parts of the bottoms along Scioto Brush Creek in the western part of the county, and yields range from 800 to 1,000 pounds an acre. The tobacco is not so dark or so heavy as that grown on limestone land, but it is in demand for cigarette tobacco. Scioto Brush Creek heads to the west in the limestone section of Adams County, where it receives wash from the limestone uplands, and the soils are, therefore, somewhat less acid than the soils along streams that receive wash entirely from sandstone uplands. This soil supports a fair growth of pasture grass consisting of redtop, some bluegrass, white clover, and alsike clover. Corn is grown for several years in succession and is followed by hay. No fertilizer, lime, or manure is applied to the soil, except for tobacco land, where from 200 to 300 pounds of a 3-8-6 or a somewhat similar fertilizer is used.

Pope silt loam, high-bottom phase.—Pope silt loam, high-bottom phase, is very similar to typical Pope silt loam, but it occupies areas slightly above the level of the first bottom, where it is not so subject to inundation as is the typical soil. The principal areas are along Pine Creek in the southeastern part of the county and along Scioto Brush Creek in the western part. Along Pine Creek a few small areas of Pope loam are included with this soil in mapping.

Pope silt loam, high-bottom phase, occupies areas with a level to gently sloping relief and has good natural drainage. It is somewhat more desirable than typical Pope silt loam for the production of crops, as it is not so subject to overflow. It is used chiefly for corn,

hay, and pasture land. Along Scioto Brush Creek some areas are used for the production of tobacco.

Pope gravelly silt loam.—Pope gravelly silt loam differs from Pope silt loam in that it contains, on the surface and throughout the soil, a considerable proportion of rounded and subangular sandstone fragments. With the exception of a few areas where the texture ranges from loam to light silt loam, the color and texture are very similar to those features of Pope silt loam. The soil is acid in reaction.

Small areas of this soil occur in the southwestern part of the county along Turkey Creek, Carey Run, and Pond Run, where it occupies first-bottom land subject to frequent flooding. The soil is well drained.

About 95 percent of the land is cleared and is used largely for pasture and for corn. Because of its gravel content, the soil is rather difficult to cultivate and is not very desirable. Occurring as it does in a very rough hilly area where the amount of land with relief favorable for cultivated crops is small, this soil is used for crops wherever possible, although much of it is rather stony. It furnishes a fair quality of pasture. It is somewhat more droughty than Pope silt loam.

Pope loam.—Pope loam is similar to Pope silt loam in color but differs in texture. The surface soil, to a depth of about 8 inches, is brown loam. This is underlain by yellowish-brown or brownish-yellow loam or fine sandy loam, which continues to a depth of 3 feet or more. As mapped the soil is variable in texture, ranging from fine sandy loam to heavy loam. Sandstone fragments are numerous on the surface and throughout the soil mass.

Included with this soil as mapped are some very small areas of fine sandy loam, the largest of which occur along Pine Creek in Vernon Township and along Little Scioto River in Madison Township. In these areas the surface soil is brown loamy fine sand or fine sandy loam, which is underlain by a fine sandy loam subsoil.

The principal areas of Pope loam are along Little Scioto River and Pine Creek. They occupy nearly level land in the flood plains of these streams. The soil is well drained and is acid in reaction.

Practically all of this soil is cleared and is used for the production of corn, hay, and pasture. Some of the sandier areas adjacent to the streams are forested.

Philo silt loam.—Philo silt loam differs from Pope silt loam in that the surface soil is grayish brown rather than brown, and the subsoil is mottled as a result of imperfect underdrainage. The surface soil is grayish-brown or light-brown silt loam to a depth of 8 or 10 inches, below which is yellowish-brown silt loam streaked with dark brown. This material is underlain, at a depth of 18 or 20 inches, by mottled brown, gray, and rust-brown silt loam. Included with mapped areas of this soil are small bodies of gray Atkins soils too small to separate on a small-scale map.

Philo silt loam, which is a first-bottom soil, occupies flat areas having fair natural drainage. It occurs chiefly in the broader flood plains along streams tributary to Ohio, Scioto, and Little Scioto Rivers. It is used chiefly as corn, hay, and pasture land. Because of its imperfect underdrainage it is not so desirable a soil for corn as is Pope silt loam.

Philo silt loam, high-bottom phase.—Philo silt loam, high-bottom phase, occupies areas slightly above the first-bottom land, and it is

not so subject to damage from floods as are the lower lying soils. It occurs chiefly in Scioto Brush Creek Valley in the western part of the county. About the same crops are grown as on the other first-bottom soils, but because of its more favorable topographic position this soil is somewhat more desirable for crops than some of the other first-bottom soils.

Philo loam.—Philo loam is similar to Pope loam in texture, but it is not naturally so well drained, as indicated by its color. The surface soil is grayish-brown loam to a depth of 10 inches. This is underlain by dull-brown loam containing rust-brown streaks and some gray mottlings. As with other sandy alluvial soils, the texture is somewhat variable, ranging from fine sandy loam to heavy loam.

This soil has fair natural drainage and is acid in reaction. It occurs in small areas in the broader valleys in the eastern part of the county in association with other Philo soils and the Pope soils. It is used for the production of corn and hay and for pasture. Because of its sandy texture it is somewhat earlier than Philo silt loam.

Atkins silt loam.—Atkins silt loam occupies the low-lying parts of the stream flood plains and has very poor natural drainage. The surface soil is gray or dark-gray silt loam containing numerous rust-brown streaks of concretionary material. The subsoil is mottled gray, yellowish-brown, and rust-brown heavy silt loam or silty clay loam. This soil is very acid in reaction. Because of its poor natural drainage it is used chiefly for pasture. Hay is cut on some areas but is of very poor quality.

Atkins silty clay loam.—Atkins silty clay loam differs from Atkins silt loam chiefly in texture. The surface soil is gray heavy silty clay loam. This is underlain by mottled gray, brownish-yellow, and rust-brown silty clay loam or silty clay. It occurs chiefly in Hales Creek Valley near South Webster, and along Pine Creek in Vernon Township. Because of its heavy texture this soil is very difficult to drain. It is used chiefly for pasture, which is of only fair quality.

MINES, PITS, AND DUMPS

Mines, pits, and dumps include areas that have been worked over in the quarrying of sandstone and in the mining of fire clay, also the dump piles resulting from these operations and gravel pits. Areas of this character occur along the slopes of the Ohio River Valley between Portsmouth and New Boston and in other parts of the county. This land has no agricultural value.

PRODUCTIVITY RATINGS⁵

In table 3 the soils of Scioto County are rated according to their capacity to produce the more important crops of southern Ohio and are listed in the approximate order of their general productivity under current farming practices.

⁵ The crop-productivity indexes (those under each crop heading) used in former soil survey reports for Ohio counties, and also in Ohio Agricultural Experiment Station Special Circular 44, A Key to the Soils of Ohio, range from 10, the highest, to 1, the lowest. Of the two indexes given in the former system, the first is indicative of crop production of the soil without special soil treatment. In the new system, on the basis of 1 to 100, the first index (in column A of table 3) is indicative of crop production under average conditions. In both the old and the new systems, the second index (column B) represents possible crop production under improved conditions. Crop-productivity indexes are not to be confused with "general productivity grade" numbers shown in the column to the right of the crop-productivity indexes. Here the best soils rate 1, the next best, 2, etc.

TABLE 3.—*Productivity ratings of soils in Scioto County, Ohio*

Soil 1	Crop productivity index ¹ for—												General productivity grade ⁴		State rating ⁵		A La ing						
	Corn			Wheat			Oats			Mixed timothy and red clover hay			Alfalfa			Tobacco			Potatoes				
	A	B	A	A	B	A	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	
Genesee silt loam, high-bottom phase.	100	120	70	90	70	80	90	100	80	100	70	100	—	—	—	—	90	100	—	—	2	2	
Genesee silt loam.	100	120	60	70	70	80	90	100	80	100	70	100	70	100	—	—	90	100	1	2	2	2	Excel. crop.
Huntington silty clay loam, high-bottom phase.	100	120	60	70	70	80	90	100	70	100	70	100	—	—	—	—	90	100	—	—	2	2	
Genesee silty clay loam.	100	120	50	60	70	90	90	100	80	100	70	100	70	100	—	—	90	100	—	—	2	2	
Huntington silty clay loam.	100	120	50	60	60	80	70	100	70	100	70	100	70	100	—	—	90	100	—	—	2	2	
Fox silt loam.	70	100	90	140	60	80	70	100	70	100	50	90	60	90	80	100	60	90	150	60	90	3	3
Wheeling silt loam.	70	100	70	120	60	80	70	100	70	100	60	90	60	90	70	80	80	90	90	80	90	3	4
Genesee loam.	80	110	60	80	60	80	80	100	60	100	60	90	60	90	70	80	80	90	90	80	90	4	
Huntington loam, high-bottom phase.	80	110	70	90	70	80	80	100	60	100	60	90	60	90	70	80	80	90	90	80	90	4	
Pope silt loam, high-bottom phase.	65	100	60	80	60	80	70	100	50	90	30	90	—	—	—	—	70	90	—	—	4	4	
Pope silt loam.	65	100	60	80	50	70	70	100	60	90	40	90	50	70	—	—	70	90	—	—	4	4	
Wheeling loam.	60	80	70	120	50	60	50	70	60	90	40	80	—	—	—	—	70	90	—	—	5	5	
Genesee fine sandy loam.	60	80	50	70	60	80	50	80	60	90	60	90	80	—	—	90	100	50	70	4	4		
Mill Creek silt loam.	60	90	60	100	50	70	70	90	60	100	60	90	60	90	—	—	60	80	50	70	4	4	
Fel silt loam.	60	110	40	60	30	60	60	100	50	90	50	90	55	—	—	60	80	50	70	3	3		
Lindside silty clay loam.	60	110	40	60	30	60	60	100	50	100	30	55	—	—	—	—	60	80	30	50	3	3	
Muskingum loam, colluvial phase.	65	90	60	100	50	80	50	90	50	100	50	80	—	—	—	—	45	100	30	70	4.5	4.5	
Pope loam.	60	90	50	80	50	70	60	90	50	100	50	80	40	80	—	—	60	100	50	70	5	5	
Holston silt loam.	60	90	60	100	50	80	50	90	50	100	50	80	—	—	—	—	60	100	50	70	4	4	
Muskingum silt loam.	60	90	60	100	50	80	50	90	50	100	50	80	—	—	—	—	45	100	20	70	4	4.5	
Scioto silt loam.	60	95	60	100	50	80	50	95	50	100	50	85	—	—	—	—	60	100	20	70	4	4.5	
Borden silt loam.	50	80	60	100	50	80	50	90	50	100	50	85	—	—	—	—	60	100	20	70	4	4.5	
Pope gravelly silt loam.	50	80	50	70	40	60	50	80	40	90	50	80	40	70	20	80	—	—	50	70	5	5	
Philip silt loam, high-bottom phase.	50	100	50	70	40	60	60	90	60	100	50	80	20	60	—	—	50	70	50	70	5.5	5.5	
Philip silt loam.	50	90	40	60	30	50	50	90	50	100	50	80	—	—	—	—	50	70	50	70	6	3	
Holston loam.	50	90	40	60	20	50	50	90	50	100	50	80	—	—	—	—	60	120	40	70	6	3	
Muskingum loam.	50	90	55	100	50	60	50	90	50	100	50	80	—	—	—	—	45	100	20	70	5.5	5.5	
Mongongahela silt loam.	50	90	50	100	40	70	50	90	50	100	50	80	—	—	—	—	40	90	40	70	5	5	

Homer silt loam	40	70	30	60	50	80	50	80	30	70	40	70	50	5
Tyler silt loam	30	60	10	60	30	60	20	70	50	50	35	30	60	6
Gimat silt loam	30	50	50	50	20	50	40	40	35	30	25	30	50	6.5
Wayland silt loam	25	60	10	40	10	40	20	60	50	50	35	30	50	6.5
Meivin silty clay loam	30	80	—	—	10	40	20	60	20	60	35	30	50	6.5
Purdy silt loam	10	50	10	50	20	50	20	60	20	60	25	30	50	7
Atkins silt loam	20	60	—	—	10	40	10	60	10	40	35	20	50	7
Atkins silty clay loam	10	60	—	—	10	40	10	60	10	40	25	20	50	7.5
Holston silt loam, slope phase	—	—	—	—	—	—	—	—	—	—	—	30	50	8
Muskogee silt loam, steep phase	—	—	—	—	—	—	—	—	—	—	—	20	40	9
Muskingum silty clay loam, steep phase	—	—	—	—	—	—	—	—	—	—	—	20	40	9
Coley shaly clay loam, steep phase	—	—	—	—	—	—	—	—	—	—	—	20	30	10
Muskingum stony silt loam	—	—	—	—	—	—	—	—	—	—	—	20	30	10
Muskingum silt loam, very steep phase	—	—	—	—	—	—	—	—	—	—	—	20	30	10
Rough broken land	—	—	—	—	—	—	—	—	—	—	—	—	10	10
Riverwash	—	—	—	—	—	—	—	—	—	—	—	—	10	10
Mines, pits, and dumps	—	—	—	—	—	—	—	—	—	—	—	—	—	—

¹ Soils are listed in the approximate order of their general productivity under the dominant current practices, the most productive first.

² The soils of Scioto County are given indexes that indicate the approximate production of each crop in percent of the standard of reference. The standard represents the approximate average yield obtained without the use of amendments on the more extensive and better soil types of the sections in which the crop is most widely grown. It should be realized that these ratings are partly inductive, as yield data by soil types are yet too fragmental to be adequate. The indexes in column A refer to yields commonly procured under average conditions and the prevailing practices of management, that include fertilization; those in column B refer to yields that may be expected under more intensive practices of management, including the use of lime where needed, fertilizers, adequate drainage, and good rotations including legumes.

³ The indexes for pasture are largely comparative for the soil types of this and adjoining counties and are not based directly on the standard because of insufficient data.

⁴ This classification indicates the current practices (A) and prevailing current practices (A) and to the text for further explanation.

⁵ These indexes have been assigned purposes of comparison of the soil types.

⁶ This is a general classification including, grazing, or forestry purposes and under intensive practices (B). In actual practice, other considerations, such as a map, are important.

⁷ Leaders indicate that the classification.

The rating compares the productivity of each soil for each crop to a standard, namely, 100. This standard index represents the approximate average yield obtained without amendments on the more extensive and better soil types of the regions in which the crop is most widely grown. An index of 50 indicates that the soil is about half as productive for the specified crop as are soils with the standard index. Soils given amendments, such as lime and commercial fertilizers, and irrigation, and unusually productive soils of comparatively small extent may have productivity indexes of more than 100 for some crops.

The following tabulation sets forth some of the acre yields that have been set up as standards of 100. They represent long-time average yields of crops of satisfactory quality on the better soils without use of amendments.

Crop:

Corn	bushels	50
Wheat	do	25
Oats	do	50
Potatoes	do	200
Mixed hay	tons	2
Red clover	do	2
Alfalfa	do	4
Burley tobacco	pounds	1,500

The indexes in columns A are based on estimated yields obtained under prevailing practices and average conditions, whereas those in columns B are based on estimated yields under improved conditions such as adequate drainage, good rotation including legumes, and the use of fertilizers and lime where needed.

The principal factors determining the productivity of land generally are stated to be climate, soil (this includes a long list of physical, chemical, and biological characteristics), slope, drainage, and management. Actually, no one of these factors operates distinctly from the others, although some one may dominate. The soil type itself is conceived by the modern soil scientist to represent "the combined expression of all those forces and factors that, working together, produce the medium in which the plant grows." Crop yields over a long period of years furnish the best available summation of these associated factors and, therefore, are used where available.

The soils are listed in the order of their general productivity, under dominant current practices, although productivity grade numbers are assigned according to both current practices and recommended practices. These grade numbers are based on a weighted average⁶

⁶ The weights in percentage given each crop index to arrive at the general productivity grade were as follows:

Crop	Soils of the—				
	Uplands	Terraces	Bottoms	Poorly drained bottoms and terraces	Grazing and forest lands
Corn	30	40	50	20	—
Wheat	20	10	5	—	—
Oats	5	—	—	—	—
Mixed hay	25	15	20	30	—
Red clover	5	10	5	—	—
Alfalfa	—	10	10	—	—
Potatoes	5	5	—	—	—
Tobacco	—	5	—	—	—
Pasture	10	5	10	20	25

of the indexes for the various crops, using the approximate areal extent and value of the various crops in the county as bases. If the weighted average is above 100 or between 90 and 100, the soil type is assigned a grade of 1; if it is between 80 and 90, a grade of 2 is given, and so on. Since it is difficult to measure mathematically either the exact significance of a crop in local agriculture or the importance and suitability of certain soils for particular crops, the weightings set up are used only as guides. Certain modifications dictated by personal judgment have been allowed in the general rating of the soils.

The column "Land classification" summarizes in a simple way the productivity and use capabilities of the various soils by placing them in a few groups, on the basis of their relative suitability for farming, grazing, or forestry.

Productivity rating tables do not present the relative roles that soil types because of their extent and the pattern of their distribution play in the agriculture of the county. They give a characterization to the productivity of individual soil types. They cannot picture the total quantitative production of crops by soil areas without the additional knowledge of the acreage of the individual soil types devoted to each of the specified crops.

Economic considerations have played no part in determining the productivity indexes, so they cannot be interpreted directly into land values except in a very general way. Distance to market, relative prices of farm products, and other factors influence the value of land.

MORPHOLOGY AND GENESIS OF SOILS

Soil is the product of the forces of environment acting upon the soil materials deposited or accumulated by geologic agencies. The characteristics of the soil at any given point are determined by (1) the physical and mineralogical composition of the parent soil material; (2) the climate under which the soil material has accumulated and existed since accumulation; (3) the relief, or lay of the land, which determines the local or internal climate of the soil, its drainage, moisture content, aeration, and susceptibility to erosion; (4) the biologic forces acting upon the soil material, that is, the plants and animals living upon and in it; and (5) the length of time the climatic and biologic forces have acted upon the soil material.

Scioto County is in the Gray-Brown Podzolic soils region,⁷ which extends from the Atlantic coast to western Indiana and Wisconsin. The soils have developed under the influence of a humid-temperate climate where the amount of rainfall has been sufficient to afford a more or less constant downward movement of moisture through the soil in addition to that lost by evaporation and surface run-off.

Nearly all of the soils are light in color and low in organic matter, owing to the fact that they were developed under a dense forest cover, which was less favorable to the accumulation of organic matter than if the land had been covered with grass. On the basis of the most striking and widely developed characteristics they can be grouped into two divisions: (1) Brown or grayish-brown well-

⁷ MARBUT, C. F. SOILS OF THE UNITED STATES. U. S. Dept. Agr. Atlas of American Agriculture, pt. 3 (Advance sheets No. 8), 98 pp., illus. 1935.

drained soils, and (2) gray or brownish-gray imperfectly and poorly drained soils. Included in the first division are the soils of the ridges and terraces, where soil-forming processes, unimpeded by excessive run-off or by imperfect drainage, have so modified the soil-forming materials through physical and chemical changes that the original geological characteristics have largely disappeared, and true soil characteristics have been developed. In the second division, soil characteristics reflect the influence of excessive moisture. A very large proportion of the soils of this county are on steep slopes, ranging from 20- to 45-percent gradient, where erosion has been so active that the development of true soil characteristics has been very much impeded. Under these conditions the soil characteristics are very closely related to the petrological features of the parent material and the substrata.

Scioto County is near the western border of the Appalachian Plateaus in a very highly dissected section. The bedrock in the central and western parts of the county includes Mississippian sandstone and shale, and outcrops of black Ohio shale occur on lower slopes near the western county line. In the eastern townships the bedrock formations include Pennsylvania sandstone, shale, and clay shale. The upland soils, which cover about 90 percent of the county, are residual from these various formations, and all other soils are derived from alluvial materials. The soils on the terraces, above the flood plains of the present streams, are derived either from slack-water deposits—silt and clay—or from stratified sand and gravel; and the soils occupying the present flood plains of the streams are derived from deposits brought in by erosion from the surrounding watersheds.

The dominant vegetation was a mixed hardwood forest (mixed mesophytic forest), with some pine. Unpublished data on a forest survey of Scioto County by the forestry department of the Ohio Agricultural Experiment Station give the following groupings: The dominant forest on the sandstone ridges includes scarlet oak, chestnut oak, post oak, black oak, also less important trees, such as sassafras, sourwood, and black gum; on the upper slopes, black oak, white oak, scarlet oak, chestnut oak, and chestnut; in coves at heads of valleys and ravines the forest growth includes tuliptree, basswood, white ash, red oak, white oak, sugar maple, and beech; and on extremely dry ridges, with western or southwestern exposure, scarlet oak, black oak, blackjack oak, chestnut, scrub pine, pitch pine, and shortleaf pine. Old fields that have been abandoned first are occupied by sassafras, persimmon, and sumac, and different varieties of pine also grow in numerous abandoned fields, especially in the western part of the county.

Under the influence of the forest vegetation, as a result of the action of the soil-forming processes, the various soil materials have been modified so that they have certain features in common. The most outstanding characteristics have resulted from an accumulation of organic matter in the upper part of the surface soil (A_1 horizon), a leaching of the lower part of the surface soil (A_2 horizon), along with a translocation downward of material in solution and of fine soil particles from the upper horizons to give a somewhat heavier B horizon. This rests on the more or less unchanged parent material

(C horizon). These soil characteristics exist in the brown or grayish-brown well-drained soils that have not been subjected to excessive erosion. Such conditions exist in the soils on some of the broader ridge tops and are especially well developed in the well-drained terrace soils, of which Holston silt loam is representative. Following is a description of a profile of Holston silt loam as observed in a cut extending to a depth of more than 20 feet, along the Chesapeake & Ohio Railway near Minford:

- A₀. A 1½-inch layer of leaf litter consisting of decomposing leaves, stems, twigs, and grass roots. The pH value is 6.4.
- A₁. 0 to 1½ inches, dark grayish-brown silt loam containing a fair amount of organic matter and being slightly granular in structure. The pH value is 6.5.
- A_{2.1}. 1½ to 5 inches, brown friable silt loam with a faint suggestion of a platy structure in the topmost 2 inches. The pH value is 4.6.
- A_{2.2}. 5 to 10 inches, yellowish-brown friable silt loam without very definite breakage. The pH value is 4.6.
- A₃. 10 to 16 inches, brownish-yellow heavy silt loam with a fine-granular structure. The pH value is 4.6.
- B₁. 16 to 30 inches, brownish-yellow silty clay loam breaking into pieces ranging from ½ inch to 1½ inches in diameter. The faces of the fragments have a red cast. The pH value is 4.5.
- B₂. 30 to 48 inches, pale-yellow silty clay loam with no regular breakage. The pH value is 4.8.
- C₁. 48 to 60 inches, pale yellowish-brown silty clay loam with a suggestion of gray along breakage lines. The pH value is 5.0.
- C₂. 60 inches +, bluish-gray silty clay showing definite laminations. The pH value is 5.2.

Similar profile characteristics are to be observed in both the Fox soils, derived from stratified sand and gravel, and the Wheeling soils, which are underlain by gravel and sand at a depth ranging from 5 to 8 feet. The Fox soils, however, have a dark somewhat sticky B₈ horizon of approximately neutral reaction just above the parent material.

Monongahela silt loam is representative of mature soils that have developed with slightly impaired underdrainage. This soil is intermediate in character between the true Gray-Brown Podzolic soils and the Planosols.⁸ Following is a description of a profile of this soil as observed in California Valley about 2 miles south of Minford:

- A₀. A 1½-inch layer of leaf litter, dark grayish-brown organic material consisting of partly decomposed roots, leaves, and grass. The pH value is 6.5.
- A₁. 0 to 1½ inches, dark grayish-brown friable silt loam with a slight suggestion of a granular structure. The pH value is 6.6.
- A₂. 1½ to 7 inches, pale yellowish-brown friable silt loam with a platy structure in the upper part. The material breaks into plates from one-eighth to one-fourth inch thick. The pH value is 5.3.
- A₃. 7 to 16 inches, yellowish-brown finely granular silt loam. The pH value is 4.8.
- B₁. 16 to 20 inches, mottled grayish-yellow and gray granular silt loam, breaking into pieces one-half inch in diameter. The pH value is 4.6.
- B₂. 20 to 26 inches, mottled yellowish-brown and gray heavy silt loam or silty clay loam with a definite vertical breakage, suggesting a columnar structure. The material breaks into pieces one-half inch in diameter, which are yellowish brown on the inside and coated with gray. The pH value is 4.6.

⁸For a definition of Planosol, see the following: UNITED STATES DEPARTMENT OF AGRICULTURE, A GLOSSARY OF SPECIAL TERMS USED IN THE SOILS YEARBOOK, U. S. Dept. Agr. Yearbook of Agriculture 1938 (Soils and Men), p. 1174. 1938.

B_s. 26 to 36 inches, mottled yellowish-brown and gray silty clay loam which breaks into irregular fragments two-thirds of an inch in diameter. The pH value is 4.6.

C_s. 36 to 48 inches, mottled yellowish-brown and gray heavy silt loam with no definite breakage. The pH value is 4.5.

C_s. 48 to 60 inches, laminated silt and clay. The pH value is 5.0.

This profile has many features in common with Sciotosville silt loam and Homer silt loam. It is very similar in its general features to Holston silt loam, except for the mottled color in the lower part of the subsoil, resulting from imperfect underdrainage, and in the tendency to the development of a claypan in the B horizon.

Purdy silt loam is representative of the gray soils that have developed under conditions of very poor drainage. The Ginat soils are very similar to the Purdy in their characteristics, and the soils of both series belong to the Planosol group. Following is a description of a profile of Purdy silt loam as observed about 1 mile southeast of Stockdale (which is in Pike County) in California Valley:

A_o. A $\frac{1}{4}$ -inch layer of leaf litter consisting of partly decomposed roots, leaves, and small twigs. The pH value is 5.5.

A_s. 0 to $3\frac{1}{2}$ inches, dark brownish-gray silt loam with rust-brown streaks. The pH value is 4.6.

A_s. $3\frac{1}{2}$ to 7 inches, mottled gray, yellow, and rust-brown silt loam. The pH value is 4.5.

A_s. 7 to 14 inches, light-gray silt loam mottled with rust brown. This layer contains many dark iron concretions. The pH value is 4.8.

B_s. 14 to 23 inches, mottled light-gray and brownish-yellow compact heavy silt loam breaking into pieces ranging from one-fourth to one-half inch in diameter. The pH value is 4.5.

B_s. 23 to 28 inches, mottled light-gray and yellowish-brown silty clay loam that breaks into pieces ranging from $\frac{1}{2}$ to 1 inch in diameter. The pH value is 4.6.

C. 28 to 40 inches, mottled light-gray and yellowish-brown silty clay loam that breaks irregularly into pieces ranging from 1 to 2 inches in diameter. The pH value is 4.9.

The Tyler soils are intermediate in drainage conditions and profile development between the Monongahela and the Purdy soils. They also belong to the Planosol group.

The upland soils, which occupy more than 90 percent of the area of the county and occupy rolling to very steep land surfaces, do not show the characteristics common to the mature soils of the county, but rather those features that indicate that the effects of soil-forming processes have been partly counteracted by erosion. Following is a description of a representative profile of Muskingum silt loam as observed 4 miles northeast of Pools Corners. It will be noted that no well-defined B horizon has developed, the B_s horizon representing a transition between the A_s and the C horizons.

A_o. A $\frac{1}{4}$ -inch layer of leaf litter consisting of partly decomposed leaves and roots. The pH value is 6.7.

A_s. 0 to $1\frac{1}{2}$ inches, dark grayish-brown friable silt loam. The pH value is 5.7.

A_s. $1\frac{1}{2}$ to 5 inches, light-brown friable silt loam, with a faint platy structure in the upper 2 inches. The pH value is 5.1.

A_s. 5 to 10 inches, yellowish-brown friable silt loam containing some small sandstone fragments. The pH value is 5.1.

B_s. 10 to 20 inches, bright yellowish-brown compact heavy silt loam containing numerous sandstone fragments. This is, in reality, only an incipient B horizon. The pH value is 5.0.

C_s. 20 to 36 inches, yellowish-brown silt loam, which becomes somewhat sandier with depth. Sandstone fragments are numerous in this layer. The pH value is 4.7.

C. 36 to 40 inches, partly decomposed grayish-yellow sandstone. The pH value is 4.8.

The steep phase of Muskingum silt loam is even more immature than is the typical soil, as shown by the greater lack of profile development, along with which is an even greater impress of the petrological characteristics of the material from which the soil is derived.

Rarden silt loam occupies a topographic position similar to that of Muskingum silt loam and shows about the same stage of development. It differs from the Muskingum soil in that the subsoil is red and yellow, rather than yellow, and is much heavier in texture. The Rarden soil is derived largely from beds of clay shale.

The flood plain soils along Ohio River consist of alluvium of mixed character, including wash from the residual sandstone, shale, and limestone areas, as well as from the glacial regions to the north. These soils have been grouped in the Huntington, Lindside, and Melvin series. The well-drained Huntington and imperfectly drained Lindside soils range from slightly alkaline to slightly acid in reaction, whereas the poorly drained Melvin soils are generally slightly or moderately acid. The well-drained Pope, imperfectly drained Philo, and poorly drained Atkins soils, all developed on alluvial flood plains, are acid in reaction. The well-drained Genesee and poorly drained Eel and Wayland soils are developed on recent alluvium washed from soils of the calcareous glacial deposits and are approximately neutral in reaction.

SUMMARY

Scioto County is in the western part of the Appalachian Plateaus region, which is characterized by a maturely dissected land surface, with narrow ridges and deep valleys with steep slopes. Two valleys, ranging from 1 to 2 miles in width, cross the county. One, the California Valley in the eastern part, is not occupied at present by any major stream, and the other, the Scioto River Valley in the central part, is occupied by the southward-flowing Scioto River. The Ohio River Valley, which extends along the southern boundary, is in places narrower than the Scioto River Valley.

The bedrock formations are largely noncalcareous sandstone and shales of Mississippian and Pennsylvanian age. Along the western border the black Ohio shale (Devonian) occurs on the lower slopes. Slack-water deposits of considerable thickness, consisting of laminated silt and clay, occupy terraces in some of the larger valleys, and elsewhere there are deposits of stratified sand and gravel.

The climate is humid-temperate, with short periods of extreme heat and cold. The long warm summers are favorable for the growth of corn, and the winters in general are favorable for fall-planted grain and hay crops.

The county is within the Gray-Brown Podzolic soils region. It was at one time heavily forested with mixed hardwoods and some pine. Under forest conditions comparatively little organic matter accumulated in the soils, and this caused the prevailing light colors.

Mature soils characteristic of the region are confined largely to well-drained sites on the terraces and to some of the broader ridge

tops. As somewhat more than 90 percent of the land has rolling to steep relief, the most extensive soils are immature as a result of erosion, which has been going on during the process of soil development.

Soils of the Muskingum group, which are extensive, are residual from sandstone and shale. Muskingum silt loam occupies the rolling ridges, and the steep phase occupies the steep slopes. In the western part of the county the Muskingum soil on hillsides with a slope of more than 45 percent is differentiated as a very steep phase. The typical soil can be used for the production of crops, whereas the steep and very steep areas, because of the difficulties in tillage and the certainty of destructive erosion in cultivated areas, are suitable only for permanent pasture or for forestry.

Rarden silt loam is a ridge-top soil derived largely from clay shale. It differs from Muskingum silt loam in the character of the subsoil, which is mottled yellow and red heavy silty clay loam, whereas that of the Muskingum soil is brownish-yellow silt loam.

The terrace soils occupy areas with relief favorable for agriculture. Many of the broader areas are poorly drained. Soils developed mainly on terraces in California Valley are included with the soils of the Holston group, and those developed on the Ohio and Scioto River terraces are included with the soils of the Wheeling group.

The brown well-drained terrace soils, which are derived from old slack-water deposits, consisting of silt and clay, and which have their most extensive development in California Valley, are members of the Holston series. The Monongahela soils are imperfectly drained, the Tyler soils are poorly drained, and the associated gray Purdy soils are very poorly drained. All these soils are strongly acid in reaction.

The Ohio River terrace is underlain at a depth ranging from 5 to 8 feet by stratified sand and gravel containing very little limestone. The brown well-drained Wheeling soils, which are only slightly acid in reaction, are considered among the best agricultural soils of the county. The associated grayish-brown Sciotoville soils and gray Ginat soils have fair and very poor natural drainage, respectively, and are acid in reaction.

In the Scioto River Valley the terraces, or second-bottom areas, which are very inextensive, are underlain by sand and gravel containing considerable limestone. The well-drained soils are included in the Fox series and those with fair drainage in the Homer series.

Much of the agricultural importance of Scioto County is based on crop production on the alluvial soils, which are very extensive, especially in the Scioto River Valley. Here, the brown well-drained Genesee soils, which are neutral in reaction, are the most extensive. The associated soils with only fair drainage belong to the Eel series, and the gray poorly drained soils to the Wayland series. These alluvial soils are derived largely from wash from the calcareous glacial drift region to the north. Corn is grown very extensively on these soils.

The alluvial soils in the smaller valleys are derived from alluvium carried in from the surrounding upland soils which consist almost exclusively of Muskingum soils derived from noncalcareous sandstone

and shale. All these soils are acid in reaction. The Pope series includes the brown well-drained soils, the Atkins series the gray very poorly drained soils, and the Philo series soils of intermediate drainage.

The alluvial soils along Ohio River are derived from a mixture of alluvial materials. The brown well-drained soils of the Huntington series are approximately neutral in reaction. The associated poorly drained gray soils are included in the Melvin series and range from slightly to moderately acid. Those of intermediate drainage belong to the Linside series and vary in reaction from slightly acid to neutral.

Agriculture in Scioto County centers around the production of corn, wheat, and hay. Other crops include oats, rye, buckwheat, soybeans, tobacco, and truck crops. Corn is by far the most important crop and is produced largely on the alluvial first-bottom and terrace soils. Especially on the Scioto River bottoms, large areas are planted to corn each year, and it is grown year after year in many fields. Only the smoother parts of the upland are used for the production of intertilled crops. The steep slopes, which are subject to serious erosion, are used chiefly for permanent pasture or for forestry. Wheat is grown to some extent, principally as a nurse crop in obtaining a stand of legumes for hay. On the upland soils yields are low, but very good yields are obtained on the more fertile terrace soils, such as Wheeling silt loam. Oats give rather low yields, owing to the climatic conditions. Soybeans and buckwheat are grown on the acid terrace soils with fair to poor natural drainage. Tobacco is produced on the well-drained soils of the terraces and on the high-bottom soils of the flood plains in the western part of the county. Truck crops are produced on the well-drained soils of the terrace and bottom lands. The nearby cities furnish excellent markets. There are a number of good orchards, most of which are on the upper slopes, which afford ideal sites as far as air drainage is concerned.

This section includes the largest area of rough forested land in the State. About 38 percent of the county is still wooded, and 77 percent of one of the western townships is wooded. Shawnee State Forest and the Roosevelt Game Preserve in the western part of the county include more than 25,000 acres. Many areas, which are not in permanent pasture or are abandoned, because of soil depletion or erosion, could be used to best advantage for forestry.

Of the agricultural enterprises, dairying is the most important. Livestock feeding and hog and sheep raising are minor activities. Poultry raising is an important side line on many farms.



Areas surveyed in Ohio shown by shading. Reconnaissance surveys shown by northwest-southeast hatching; cross-hatching indicates areas covered by both reconnaissance and detailed surveys.

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